THE UNIVERSITY
of EDINBURGH

How do workplace walking programmes produce their effects? A realist evaluation of the Step Count Challenge.

Mary Allison

PhD

The University of Edinburgh

July 2021

Abstract

Background: There is robust evidence that walking reduces risk factors for non-communicable diseases; however, the few studies of interventions to increase walking in workplaces settings (where we spend a large proportion of our working lives) have reported only limited success. This leaves programme designers with inadequate guidance. To address this, a realist research approach was used to evaluate how and why the Step Count Challenge, which is a long-established programme from the charity Paths for All, produces the effects it does. This thesis is the first to explain how the Step Count Challenge might work.

Methods: This evaluation was aligned with the standards for the conduct of realist research. Stage one included interviews, a workshop and desk research. From these data, programme theories were developed. In stage two, a realist synthesis was used to refine these theories. In stage three, case studies of workplaces were used to test the programme theories.

Results: The core theories of how the programme works include employer leadership, teamwork, health needs, a need for headspace, peer pressure and competition. Commitment to employee wellbeing is important for employer sign-up. For employees, sign-up is influenced by knowing the value of walking for health, combined with gentle peer pressure. The core process of 'step counting in a workplace group' is a balance between personal goals and group dynamics. High levels of physical activity are generated from having fun, participating in a competition, and challenging oneself to do more. In other contexts, goal focus and group pressure can generate stress and/or drop out.

Conclusions and Recommendations: Workplace walking challenges should encourage participants to clarify and develop personal health goals. Offering participants ideas and options to manage their group dynamics should also be included. Realist research proved fruitful to explain this complex physical activity intervention and documenting the method may help others to try it.

Lay Summary

Many working-age adults are not physically active enough to prevent illness and promote good health and contacting them through their workplaces can be a good way to support them to get more active. Walking has been proven to be one of the most successful ways to keep physically active and measuring how many steps we take is an easy way to measure whether we are getting enough activity. However, although there are programmes in workplaces that seem to be good at helping people to take more steps, we still don't know that much about how they manage to do this. This means it's difficult to know if these programmes are working as well as they could.

My research uses a particular way of thinking about how walking challenges might work. This research approach is called realist evaluation. This approach involves thinking about all the ways in which people's contexts might affect how they respond to this kind of challenge. It also involves thinking in an investigative way and uses lots of different information to help understand how people react to workplace walking programmes.

My study started by creating a map of thoughts (my theories) about how one of these kinds of programmes (the Step Count Challenge) might work. I spoke to staff and people who had taken part in the challenge. Gradually, I improved my theories through reading and talking to more people. Finally, I tested out my theories on companies and people who have taken part in the Step Count Challenge.

In the end I found that there are lots of things that affect the experience people have when they sign up to the Step Count Challenge. For example, people who have strong personal health goals at the start and who are in a strong workplace team tend to do lots of steps and approach it as a competition. For those with a personal health goal, it can be a good challenge and for those with a good team it can be great fun. If you don't have a good team or a strong personal goal, then it's likely that you won't get much out of it.

This study is the first to use this method and to show that it can help us understand how these programmes work. Although there are lots of other factors that affect people and that can be important, I hope that my findings will be helpful for the people who design and deliver workplace walking challenges. I also hope that my work will encourage others to use this method to discover more about how and why physical activity programmes work.

Table of Contents

Figures

Tables

Appendices

NOTES on the electronic format:

The bibliographic references are presented in APA format. The text is formatted consistently for online reading, in a pragmatic style, to maximise the use of MS Word auto features and cross referencing.

Navigation Pane: This thesis has been formatted to use a navigation pane. This can be activated in Word using the view tab and checking the Navigation Pane box. The structure will open in a panel on the left side of the screen. This provides hyperlinks to section headings. Clicking on the right-pointing arrows unpacks sub-section headings.

Cross-referencing: All figures, tables and appendices have been cross-referenced. This means that by hovering over the reference to the figure, table or appendix you can activate a link.

Key realist constructs are presented in a Glossary and there are electronic cross-references to this throughout the text. This means you can press ctrl +click on the construct in the text to be returned to the Glossary for the explanation (if required).

Acknowledgements

My heartfelt thanks are extended to my supervisors Dr Ailsa Niven and Professor Ruth Jepson. Your enthusiasm and encouragement were as much appreciated as your wisdom and technical knowledge. At all times I felt safe and supported to share my unformed ideas and my realist ramblings – you created a fabulous space for me to explore and learn. What more could anyone ask for? I am also grateful that you were the gateway to the many lovely people and teams of support in both PAHRC and SCPHRP. I'm also grateful to have learned the value of team knitting and communal jigsaws for my wellbeing.

Also thank you to the ESRC and the Scottish Graduate School for Social Science for funding my PhD process. This, along with the amazing support of the Institute for Academic Development (IAD) provided many opportunities for me to learn and develop my skills as a researcher, as well as spaces to 'shut up and write!'.

Paths for All staff – you were amazing! Thank you for sharing your desks, your coffee and your ideas. Carl and Sarah, you listened to my abstractions and responded with enthusiasm, and you made me believe there was a purpose and value in what I was doing. For all the jobs you helped me out with and the time and space you made to listen, I'm grateful. It was the hardest of days to learn of Ian's death as I was writing my final pages. I'm glad I got to walk with him, to blow away the cobwebs and to mull over life and the value of walking in the great outdoors.

To the businesses and individuals who remain anonymous, and who helped me at numerous points in the study, I was so grateful you made the time. It really would not have been possible without you, and I hope I have honoured your experiences of the Step Count Challenge.

To all my family, friends, neighbours and colleagues who asked me 'have you finished it yet?' thank you! The accountability and knowledge that you cared, helped me over the line. To my employers at Sistema Scotland – thank you for your flexibility and support in the final stages.

Finally, but always first, my love to John who made it possible for me to tick a big item off my bucket list and who knew how much it mattered to me to finish this.

Abbreviations

ART – Attention Restoration Theory

BMI – Body Mass Index

BMJ – British Medical Journal

CEO – Chief Executive Officer

CINAHL – Cumulative Index to Nursing and Allied Health Literature

CMO – Context, Mechanism, Outcome

CV – Cardio-vascular

ESRC – Economic and Social Research Council

HBM – Health Belief Model

IRPT – Initial Realist Programme Theory

MET – Metabolic Equivalent

MRC – Medical Research Council

MVPA – Moderate to Vigorous Physical Activity

NCD – Non-Communicable Disease

PAF – Population Attributable Fraction

PAHRC – Physical Activity for Health Research Centre

QDAS – Qualitative Data Analysis Software

RAMESES – Realist and Meta-Evaluation Standards

RCT – Randomised Controlled Trial

RPM – Reasonable Person Model

SCPHRP – Scottish Collaboration for Public Health Research and Policy

SCT – Social Cognitive Theory

SDT – Self Determination Theory

SGSSS – Scottish Graduate School for Social Science

WEF – World Economic Forum

WHO – World Health Organisation

Glossary of realist concepts

Retroduction

Retroduction is the realist form of reasoning. "Retroduction has been identified by Harrè and Bhaskar as overcoming the deficiencies of the logics of induction and deduction to offer causal explanation. Retroduction entails the idea of going back from, below or behind observed patterns or regularities to discover what produces them" (Lewis-Beck, Bryman, & Futing Liao, 2004) (p.972). This approach provides the required ontological depth to be able to identify generative causation (Justin Jagosh, 2020) .

(For fuller explanation and worked example of retroduction see page 36)

CMO: Context, Mechanisms, Outcome configurations

There are three core constructs in realist programme theories: context, mechanism, and outcome (CMO). Taken together these three constructs are developed, configured as a CMO theory, and tested to create the programme theory.

Context

From a realist perspective there is no definitive 'checklist' of contextual factors, simply a requirement to delve deeply (Justin Jagosh, 2020) into the relevant contextual factors for the programme. Pfadenhauer et al. (2017) offer seven domains of context with which programmes will interact in their implementation: geographical, epidemiological, socio-cultural, socio-economic, ethical, legal and political. According to Greenhalgh, Wong , et al. (2017) "contexts do not refer to places, people, time or institutions per se, but to the social relationships, rules, norms and expectations that constitute them, as well as the resources available (or not)" (p.3).

(For an extended definition and discussion on context see page 25)

Mechanism

Mechanism is what it is about an intervention that generates the change which happens between intervention activities (inputs) and the outcome of the intervention. It is important to programme theory development to understand that the mechanism is not the activities of the intervention, nor is a mechanism the relationship between observed variables (Astbury & Leeuw, 2010). A mechanism, from a realist approach, is what generates the relationship between variables (Dalkin, Greenhalgh, Jones, Cunningham, & Lhussier, 2015). These mechanisms are "underlying entities, processes or structures which operate in particular contexts to generate outcomes of interest" (p.368) (Astbury & Leeuw, 2010).

(For an extended definition and discussion of mechanisms see page 26)

Outcomes

In realist thought, outcomes are the product of specific mechanisms being activated in specific context. It is not therefore the definition of an outcome per se that is distinctive, it is the perspective on how outcomes are generated and how they are specific to the mechanism and context through which they were produced.

(For an extended discussion of outcomes see page 27)

Chapter One: Introduction

The goal of this PhD

This PhD has been a partnership with Paths for All, a Scottish Charity founded in 1996, that champions everyday walking through advocacy, interventions, and infrastructure. When I set out in 2017, the goal of this PhD was to contribute new knowledge that could improve the effectiveness of the Step Count Challenge, a specific workplace walking intervention delivered by Paths for All.

Specifically, by making what can be implicit and intuitive for staff and participants more explicit and testable, I hoped to assist Paths for All to improve their reach and impact. I also hoped that those who need to strengthen the business case for investment in workplace walking programmes could be supported to be more transparent about how their programme works, in what circumstance and why and what may need to be changed to improve the likelihood of delivering better outcomes for more people.

The PhD was funded by the Economic and Social Research Council (ESRC) through the 'interdisciplinary steer' of the Scottish Graduate School for Social Sciences (SGSSS). The interdisciplinary and collaborative nature of the PhD has been an important context to produce learning that could be helpful for those working to improve the effectiveness of workplace walking programmes.

About me, my Research Supervision Team and my Research Advisory Team.

The design, delivery, analysis and writing at each stage of this PhD was led by myself. This PhD was engaging for me as I was involved in the evaluation of one of the first walking for health interventions in Scotland. In 1998, as a researcher at the Centre for Leisure Research, I was contracted to evaluate the 'Fitline Campaign'. This was sometimes referred to as the 'Gavin' campaign as it was fronted by the former Scotland Rugby Internationalt, Gavin Hastings. The campaign provided telephone advice and information about walking and was promoted through a TV advert with the central message 'walking a mile uses the same energy as running a mile'.

In the 25 years since the Fitline Campaign, I have witnessed and contributed to the growth of policy and practice that encourages and supports people in Scotland to walk for health. Knowing the potential of walking to improve health and quality of life and being able to test ways in which practice and outcomes can be improved was an important motivation for me to conduct and complete this PhD.

I had also been a participant in several Step Count Challenges as an employee. On each occasion, my experience was different. Sometimes I walked for miles to accumulate steps, other times I barely moved, sometimes I was driven to win, other times I forgot to record my steps. I was genuinely curious about the experience of others, as well as the intent of those who designed and delivered the programme. For me personally, there also seemed to be limited opportunities for adults to be physically active through and in work. The opportunity to help workplaces understand more about the workplace walking was appealing.

Finally, I was drawn to try using realist methods as I wanted to be challenged to learn a new approach to evaluation. I had worked in various applied research roles using pragmatic approaches to programme evaluation and realist research seemed a natural progression. Its focus on using mixed methods to unearth the rich, deep, and diverse experiences of those who participate in programmes seemed to chime with my own experience of managing and delivering health promotion programmes where, it seemed, no one size fitted all.

Interdisciplinary supervision came from Dr Ailsa Niven in the Physical Activity for Health Research Centre (PAHRC) and Prof Ruth Jepson, the Director of the Scottish Collaboration for Public Health Research and Practice (SCPHRP) – both centres are based in the University of Edinburgh. Ailsa Niven is an expert in sport and exercise psychology and has previously led the MSc in Physical Activity and Health. She has undertaken research about the Step Count Challenge in partnership with Paths for All. Ruth Jepson is Professor of Public Health in the School of Health and Social Science. Ruth is an expert in the development and evaluation of complex public health interventions. I refer to Dr Niven and Prof Jepson in my thesis as my research supervision team.

I also had with frequent meetings with Carl Greenwood (Senior Development Manager) and Sarah Turner (Development Officer) from Paths for All. Carl and Sarah helped inform and shape my decisions at critical stages and I refer to this group as my research advisory team.

About the Step Count Challenge

Before getting into the detail of the thesis, I thought it would be helpful also to describe the Step Count Challenge and explain why it is a good choice of intervention on which to base my thesis.

The Step Count Challenge is an intervention that has been offered by Paths for All to workplaces in Scotland since 2014. It attracts between 2000 and 4000 participants each time it is offered. Its longevity, scale, and level of awareness within the policy and practice communities makes it a credible choice of intervention to research and develop.

The Step Count Challenge aims to increase walking in the workplace and is facilitated primarily through a website. Teams of five colleagues sign up online to undertake either an 8week Spring, or a 4week Autumn step-counting challenge, each with a team leader. A workplace can enter any number of teams and there is often a local workplace co-ordinator who supports team leaders with the challenge. Personal step count goals are established in the first week and then each week personal daily step counts are uploaded and aggregated into a team step count which is displayed in an online leader board. This is supported by motivational emails, case studies and spot prizes. Further information about the programme can be found here https://stepcount.org.uk/how-it-works/

The Step Count Challenge continued to be offered throughout the period of the COVID-19 pandemic, with some minor variations to the timing and duration of the challenge. It should be noted that my data collection was completed at the end of February 2020 just as the COVID-19 pandemic started to affect the ways businesses could operate. Although this did not affect any of the core data collection, it did mean that I could not return to the workplaces to share the findings.

The general approach adopted for this PhD

The value of walking for health had been well established (Murtagh et al., 2015) and the Toronto Charter for Physical Activity (2010) had identified workplaces as a specific context where physical activity intervention was required (p.5). In 2008 the World Health Organisation (WHO) and the World Economic Forum (WEF) (World Health Organisation, 2008) recommended physical activity in the workplace as a route to prevention of non-communicable disease. However, despite that context, systematic reviews (Dishman, Oldenburg, O'Neal, & Shephard, 1998), (Dugdill, Brettle, Hulme, McCluskey, & Long, 2008), (Abraham & Graham-Rowe, 2009), (Malik, Blake, & Suggs, 2014) could find only a limited number of studies and limited evidence of effective interventions.

Much of the research relating to physical activity, walking and health has been based on experimental research approaches designed to establish causation between physical activity and health. Through applying controls within trials (such as randomisation and blinding) researchers can

draw certain conclusions from the trial. However, although necessary, trials are insufficient to answer many of the questions facing physical activity researchers today. As Kelly et al. (2018) noted in their scoping review for mental health and walking:

> "To have population-level effects, there is a need to transfer promising laboratory and treadmill findings to ecologically valid, free-living settings. This will require the development of robust programme theory to understand and evaluate delivery and impact. Similarly, the need to establish and understand mechanisms of effect is an important priority for future research." (p.7)

Some of this 'need' for additional research approaches is that programmes such as the Step Count Challenge can be regarded as 'complex interventions' (Craig, Dieppe, Macintyre, Nazareth, & Petticrew, 2008). They produce a variety of outcomes, involve a range of individuals, groups and organisations and the intervention itself can be used flexibly to suit the needs of those involved. Moreover, programmes such as the Step Count Challenge also operate within a 'complex system' (Petticrew et al., 2019). They are delivered in workplaces that have a range of physical and cultural environments, involving people with diverse personal and social characteristics and experiences. To understand and evaluate such programmes requires researchers to take a 'complexity perspective' (Norris et al., 2019).

Ray Pawson and Tilley (1997) propose that complex programmes have to be understood in terms of 'what works for whom and in what circumstances' (p. xvi). Since the 1990s there has been growing interest and refinement of what is now referred to as 'realist approaches'. Ray Pawson and Tilley (1997) identified the weaknesses in using traditional experimental designs to evaluate complex programme-based interventions, setting out a list of 'missing ingredients' (p.54) relating to the underlying processes that operate within and around experiments.

It was therefore agreed in my research supervision team, based on the literature described above, that realist research methodology could potentially offer a way to approach this PhD and embrace a broader complexity perspective on the Step Count Challenge. This would allow me to address the overall research goal to make more explicit and explain how the Step Count Challenge works. Within my explanatory focus, I had the following questions in mind:

- What kind of outcomes does participation in the Step Count Challenge produce?
- Why does participation in the Step Count Challenge produce these outcomes?
- How are the outcomes of participation shaped by context?

Taken together, I felt that addressing these questions would offer richer explanatory perspectives on participation in workplace walking challenges than had been generated in previous research.

The PhD had three stages, with significant iterative work within and between each stage. The stages align broadly with each of the three years of the PhD:

- Stage One: Generating initial realist programme theories.
- Stage Two: Undertaking a realist synthesis to test and refine the programme theories.
- Stage Three: Undertaking case studies to further test and refine the programme theories.

Figure 1 illustrates the overall approach and is used throughout the thesis to illustrate the specific stage under discussion. This illustrates how previous evaluations have quantified inputs and outcomes, but not the processes and mechanisms of change. The figure also shows how the realist approach seeks to address the questions of mechanisms, working in contexts to influence outcomes. Finally, the figure illustrates the three stages that I will use to build and refine these realist theories.

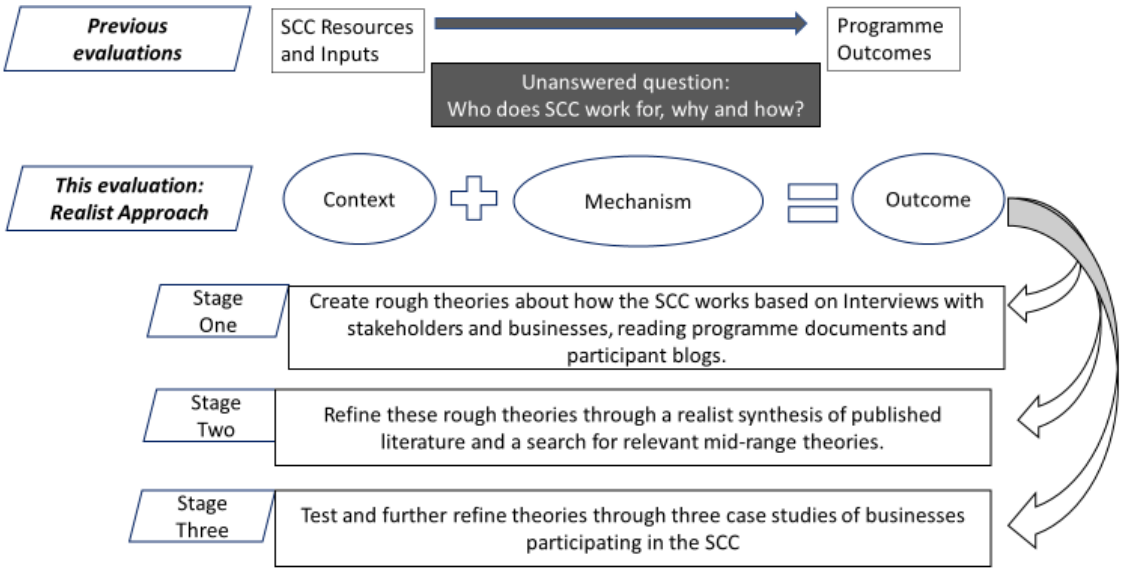


Figure 1: Overall approach to the study

I will return to this Figure in subsequent chapters, but it is worth noting at this point that I was not attempting in this thesis to assess whether the Step Count Challenge 'worked' or 'did not work'. My focus was very specifically to understand and explain how and why the Step Count Challenge produces the effects that it does. The purpose of this focus was to assist staff working in such programmes to understand more about the complexity of these programmes and to be able to intervene to improve them.

The structure of this thesis

This thesis is set out in ten chapters. Chapter Two introduces what we know about physical activity and health and specifically what we know about walking, step counting and workplaces as a setting for physical activity programmes. Chapter Three explains the thinking behind the realist approach. It offers a rationale for why this approach is a helpful method to use to understand how workplace walking programmes produce effects. In Chapter Four the overall methodology is set out. This chapter has a focus on explaining the study design, the core components of each stage and the overall approach to information management and ethics. Chapters Five to Seven are where each stage of the research is explained in detail. Each of these chapters corresponds with a stage of the research and describes the detailed methods, findings and conclusions that inform the next stage. In Chapter Eight conclusion from the results of all three stages are presented and in Chapter Nine I offer recommendations in the context of the study's strengths and limitations. My thesis ends with my personal reflections on the PhD process.

Chapter Two: Physical activity, walking and workplaces

Introduction

I begin this chapter with a summary of the research examining links between physical activity, walking and health. I then describe what we know about walking and specifically step counting programmes delivered in a workplace setting. These sections draw on established thinking that has informed the design of interventions in physical activity and draw largely from the discipline of public health. I then follow this with a critical analysis of how much we currently understand about what kind of effects workplace walking programmes produce and how and why they do so. In this latter section I introduce literature from other disciplines, such as economics and cultural studies to demonstrate the potential value and challenge of inter-disciplinary perspectives.

I conclude the chapter with a summary of the implications of the research for this study and for the choice of methodology.

Physical activity, walking and health

Physical activity is defined by the World Health Organisation (2020) as "any bodily movement produced by skeletal muscles that require energy expenditure". To promote the value and need for physical activity for good health, many countries have produced national guidelines. These guidelines generally summarise the evidence on the link between physical activity and health and provide detailed guidance on how much physical activity is required to reduce the risk of poor health outcomes. Over recent decades, with the growth in evidence, they have expanded to become tailored to specific populations; children, older adults, women who are pregnant etc.

In their recent review of worldwide strategies for physical activity guideline communication, Budzynski-Seymour et al (2020) found that 130 of the 195 countries of the WHO had published guidelines for the recommended physical activity for health. In the UK, the guidelines for adults were updated in 2019 (UK Department of Health and Social Care, 2019). The current UK physical activity guidelines for adults (19 to 64 years) are (quoted directly and in full):

- "For good physical and mental health, adults should aim to be physically active every day. Any activity is better than none, and more is better still.
- Adults should do activities to develop or maintain strength in the major muscle groups. These could include heavy gardening, carrying heavy shopping, or resistance exercise. Muscle strengthening activities should be done on at least two days a week, but any strengthening activity is better than none.
- Each week, adults should accumulate at least 150 minutes (2 1/2 hours) of moderate intensity activity (such as brisk walking or cycling); or 75 minutes of vigorous intensity activity (such as running); or even shorter durations of very vigorous intensity activity (such as sprinting or stair climbing); or a combination of moderate, vigorous, and very vigorous intensity activity.
- Adults should aim to minimise the amount of time spent being sedentary, and when physically possible should break up long periods of inactivity with at least light physical activity."

For the purpose of measuring and advising on health outcomes, scientific studies commonly classify physical activity dimensions according to mode (for example walking or cycling), frequency (number of sessions or bouts), duration (time per week) and intensity (rate of energy expenditure) (Strath et al., 2013). Taking some of these dimensions together, the analysis of physical activity in relation to

health outcomes is often based on the intensity of energy expended. Using these measures of energy expenditure researchers commonly classify activities as sedentary, light, moderate and vigorous/very vigorous based on a metabolic equivalent (MET) measure (Strath et al., 2013). Walking is generally classified as a moderate physical activity, sufficient to meet the 150minutes a week guideline.

In the past, concepts of physical activity, inactivity, sitting time and sedentariness were not well delineated or characterised in many research studies. However, in recent decades these concepts have become more distinct. In relation to the workplace, they are each of relevance. The nature of our work can produce both physical activity and inactivity, as well as how we travel to and from work, and the nature of social and recreational activities organised through and in work.

In the past decade, there has been increasing attention on the relationship between sedentary behaviour, sitting behaviour and physical activity. In 2009, it was established (Katzmarzyk, Church, Craig, & Bouchard, 2009) that sedentary behaviour (a MET equivalent of <1.5) was an independent risk factor for all-cause mortality, heart disease and cancer. It was also established (Chau et al., 2013) (Ekelund et al., 2016) that high levels of physical activity (60-75 mins per day) can eliminate the health risks of high levels of sedentary behaviour, but can only reduce the risk for those with high levels of sitting and, in particular, high levels of television watching (Ekelund et al., 2016). The research confirms that addressing physical activity, sedentary behaviour and sitting are all relevant and to some extent independent goals for public health (Kazi, Duncan, Clemes, & Haslam, 2014). The goal to reduce sedentary time is also now reflected in the public health guidelines for the UK (Public Health England, 2020).

The relationship between physical activity and health

In the UK, the first substantive epidemiological evidence linking physical activity and health outcomes was based in workplace settings and became known as the Whitehall Study. The link between coronary heart disease, stroke and other vascular diseases was evidenced in papers from this study in both the Lancet (Morris, Heady, Raffle, Roberts, & Parks, 1953) and the British Medical Journal (Morris & Crawford, 1958). Morris's research paved the way for future studies and since the 1950s there has been a growing body of evidence about the relationship between physical activity and health.

The volume of research linking physical activity to cardiovascular health outcomes has grown to the extent that Kraus et al. (2019) were able to conduct their recent review of physical activity and all-cause mortality, cardiovascular (CV) mortality and cardiovascular (CV) disease using only published systematic reviews and meta-analysis. They concluded that, for inactive adults, there is a clear dose/response relationship with the benefit of physical activity greatest in moving from inactivity to some activity. The guidance on 150 minutes of moderate activity was also supported as optimal for risk reduction of all-cause mortality and CV disease.

It has been established now that physical inactivity also contributes to a range of specific diseases and illnesses. In a Lancet series on physical activity in 2016 (Sallis et al., 2016) global estimates of the burden of disease attributable to physical inactivity (expressed as Population Attributable Fractions or PAFs) were updated. This demonstrated a PAF for all-cause mortality of 9%, coronary heart disease 6%, type II diabetes 7%, breast cancer 10% and colon cancer 10%. Also, for the first time, the evidence was strong enough to add estimates for dementia 3.8%. These analyses allowed Kohl et al (2012) to conclude that physical inactivity was as important as obesity and tobacco in terms of its contribution to the global burden of disease.

Whilst much of the physical activity research of the past century focussed on the links between physical activity and physical health outcomes, in more recent decades the evidence for the link between physical activity and mental health outcomes has become increasingly well-established and differentiated (Faulkner & Taylor, 2005), (Bize, Johnson, & Plotnikoff, 2007), (Marquez et al., 2020). Just as with physical health, there are a wide range of mental health functions that are associated with physical activity. These include, for example, mood, self-esteem, cognitive functioning, depression and quality of life (Biddle, 2016).

In a recently published commentary (Teychenne et al., 2020) there was a plea to consider the need to inform physical activity guidelines more explicitly with mental health promotion and mental illness prevention outcomes. Importantly, Teychenne et al make a strong research case to distinguish between physiological mechanisms and psychosocial mechanisms and how these may be impacted by the context of the physical activity – for example incidental activity such as housework or purposeful activities in leisure time. Acknowledging these differences in context could impact future physical activity guidelines, including those that may relate to workplaces as a specific context.

From a public health perspective, the link between physical activity/inactivity and health outcomes is well established and continues to grow. The growth of public health research in physical activity has enabled researchers to differentiate between modes, frequencies, intensities and durations of activity and link these more carefully to specific health outcomes described above. Research has also made it possible to consider different ages, conditions and settings for activity. This is also now reflected in more comprehensive, but arguably more complex, public health guidelines.

A justification for the role of walking as a way of addressing physical inactivity

Since the publication of the Surgeon General's 1996 report recommending adults accumulate 30 minutes of moderate activity on most days of the week (US Department of Health and Human Services, 1996), there has been a particular interest and focus on walking as the easiest way of achieving this. With it being possible to accumulate 30 minutes of moderate activity across the day and in later guidance 150 minutes of MVPA across the week (Haskell et al., 2007), (UK Department of Health Physical Activity Health Improvement and Protection, 2011) walking has become one of the most relevant and affordable options to reach the scale required for population health impact.

As there is almost no skill required to walk and because entry-level goals can be set at achievable levels and personalised to the individual, walking is an easy way to build up from being inactive to being moderately active (Morris & Hardman, 1997) (Mutrie & Hannah, 2004). Having such a low skill entry point also means that increased perceptions of competence can be achieved, such as that reported in the 2014 evaluation of the Step Count Challenge (Niven, 2015).

The work of Murphy et al (2007) has demonstrated through empirical studies and meta-analysis that walking improves risk factors for disease. In their meta-analysis of 23 randomised controlled trials (RCTs) of walking interventions, they showed that these interventions increased V_{O2} max and decreased body weight, BMI, percentage body fat and resting diastolic blood pressure in previously sedentary adults. Murtagh et al. (2015) updated the 2007 study and found, through a meta-analysis of 32 studies, further confirmation of the value of walking to modifiable risk factors for coronary heart disease.

With much the same pattern as that found for physical activity more broadly, the evidence for walking and mental health has been lagging in relation to that for physical health outcomes. Kelly,

Murphy, and Mutrie (2017) noted that "unlike the evidence for the physiological benefits of walking, there is no clear synthesis of the literature that focuses on walking to date" (p.12).

To address this gap, Kelly et al. (2018) published the first scoping review for the evidence linking walking and mental health. From the inclusion of 50 studies and 5 systematic reviews, they were able to conclude that for mental ill health outcomes, such as depression and anxiety there "may be sufficient evidence to prevent and treat these conditions". For positive mental health outcomes, such as happiness and subjective wellbeing, they concluded that research has been both limited and poorer quality.

In the same way that research has accumulated for physical activity and health outcomes, so too has this been the pattern for walking and health outcomes. Whilst researchers in physical activity and health continue to debate the merits of higher intensity and vigorous exercise, it seems now well established that walking is the most accessible form of physical activity for most inactive adults to become moderately active thus achieving the greater levels of population health gains.

The use of pedometers and step counting

Given the demonstrated value of walking as a tool to achieve population levels of physical activity scientists and researchers were interested in the use of tools to measure and monitor walking specifically. Accelerometers had proven valuable for researchers to measure physical activity more accurately than could be achieved by self-report, but they were expensive and overly technical for personal use at scale (Tudor-Locke, 2002). Pedometers however were increasingly available, simple to operate and affordable. The pedometer's function as a tool for both participant feedback and data for research led to an interest in pedometer-supported walking interventions.

In the past couple of decades there have been several reviews that have sought to illuminate whether, why and how pedometers might work as a tool to promote more walking. Broadly they all point to their value in supporting goal setting with simple and instant feedback. More recent reviews now acknowledge that the technology has moved on and that wearable devices and mobile phones now serve this purpose.

Bravata et al. (2007) published their systematic review of the use of pedometers to increase physical activity in adults. They found 26 eligible intervention studies, of which 18 were observational studies and 8 were RCTs. They concluded that pedometer users increased their activity levels from baseline measures by 26.9 percent. They also concluded that an important predictor of the increase was having a goal (such as 10,000 steps).

Tudor-Locke and Lutes (2009) develops the understanding of the relationship between pedometer use and health outcomes further when she seeks to understand the question of why pedometer programmes work, for whom and under what conditions. Her conclusions are that pedometers work because they offer 'an affordable and accessible technology that is simplistic in output, low-literacy friendly, and immediately understandable to end-users' (p.981). However, although evaluations and reviews of interventions offer some insight about who they benefit (largely women) and under what circumstances (largely relating to goal setting) Tudor-Locke and Lutes (2009) concludes that 'a clearly articulated programme theory is lacking in most interventions' (p.981).

In 2013, a Cochrane review of workplace pedometer interventions for physical activity (Freak - Poli, Cumpston, Peeters, & Clemes, 2013) found four studies and concluded that there was "limited and low-quality data providing insufficient evidence to assess the effectiveness of workplace pedometer interventions" (p.2). This Cochrane study was updated in 2020 (Freak-Poli, Cumpston, Albarqouni, Clemes, & Peeters, 2020) and although 14 studies were found suitable for inclusion, the review

concluded that "current evidence is insufficient to suggest that a pedometer-based intervention would be more effective than other [physical activity] options" (p.2). It further concluded that pedometers as a specific device were no longer the most relevant technology to count steps and that users were replacing pedometers with other smarter devices.

With the proliferation of tools to count steps, there was concurrent interest in establishing how many steps were required to improve health (Choi, Pak, & Choi, 2007; Tudor-Locke & Bassett, 2004). Since the 1960s, Japan had adopted a notional 10,000 steps per day goal. This was based on a marketing campaign from the 1960s, led by a step count manufacturer. The step counter itself was called 'manpo-kai' which translates to 10,000 steps (originated by Hatano (1993) and quoted in Tudor-Locke and Bassett (2004)). The embeddedness of the 10,000 steps goal in Japan, combined with its simplicity, meant that it was promoted by media as a relevant goal for adults using pedometers.

However, this media-led focus on 10,000 steps (at the end of the 20th century) was inconsistent with the official public health recommended minimum level of physical activity for adults at that time– an accumulation of 30 minutes of moderate to vigorous physical activity (MVPA) per day (US Department of Health and Human Services, 1996). For most healthy adults, 30 minutes of MVPA, as an intermediate outcome towards the overall all-cause mortality reduction outcome, equated to walking between 3000 and 4000 steps (Tudor-Locke & Bassett, 2004). Choi et al. (2007) demonstrated in their review that for many healthy adults their average step count, without intervention, was between 4000 and 6000 steps. However, this was more likely to reflect the bias towards recruitment of more active people in their research samples (particularly studies with samples from universities) than a true reflection of population baseline step counts.

For those with more sedentary lifestyles, who were the target for the health-related physical activity message, the goal of 10,000 steps was likely to be too high. Tudor-Locke and Bassett (2004) therefore concluded that an index of step count goals could be helpful, if tailored to baseline physical activity levels. She suggested goals for four categories: sedentary (<5000), low active (5000-<7499), somewhat active (7500-<9999) and active (10000>). However, in concluding, Tudor-Locke noted "we need to facilitate sustainability by advocating social and environmental supports associated with increased steps/day while simultaneously promoting individual control over the number and patterns of steps taken" (p.7).

Thus, despite the awareness and popularity of the 10,000 steps goal, those who have studied it (Le-Masurier, Sidman, & Corbin, 2003), (Kang, Marshall, Barreira, & Lee, 2009) conclude that it is probably only effective for those who are already active. In addition, as Tudor-Locke and Bassett (2004) concluded, sustainable behaviour change will need to take account of the complexity of social and environmental contexts (at any level of baseline activity).

Physical activity in workplace settings

For those who study physical activity and work/workplace settings from a public health perspective, their interest tends to lie in the role of work as a generator of sedentary behaviour as well as the use of workplaces as a setting to reach inactive adults. Despite promising large-scale single studies of PA interventions in workplaces (Gilson, McKenna, Cooke, & Brown, 2007), (Gilson, McKenna, & Cooke, 2008), (Gilson et al., 2009), (Gilson et al., 2013), (McEachan et al., 2011), the systematic reviews of both health-related (Dishman et al., 1998), (Hildebrandt et al., 2001), (Dugdill et al., 2008), (Abraham & Graham-Rowe, 2009), (Malik et al., 2014) and work-related (Proper, Staal, Hildebrandt, van der Beek, & van Mechelen, 2002), (Proper & Van Mechelen, 2008) outcomes have found both limited data for inclusion and limited effects from the data that were included. However, both the policy

context (World Health Organisation, 2008) and the theoretical benefits (Batt, 2009), (Ryde & Brown, 2017) remain strongly supportive of the value of intervening to promote physical activity in and through the workplace.

In 2008 the World Health Organisation (WHO) and the World Economic Forum (WEF) jointly produced the report, 'Preventing non-communicable diseases in the workplace through diet and physical activity' (2008). The report was in the context of the Global Strategy on Diet, Physical Activity and Health, which was adopted by the 57th World Health Assembly in May 2004. Non-communicable diseases (NCDs) were estimated to be responsible for 60 percent of all deaths worldwide (Batt, 2009) and were forecast to increase by 17 percent in the period 2005-2015. The cost of such deaths to national economies were significant. For example, the report stated that "China will lose around 558 billion international dollars from the period 2005-2015 as a result of the burden of NCDs" (p.6) The equivalent figure for the UK was estimated to be 33 billion international dollars.

Further, the reported level of physical inactivity is 23 percent globally (World Health Organisation, 2017) and the economic burden has been calculated to be $53.8 billion in health care costs and $13.7 billion in productivity losses (Ding et al., 2016). Given this context and the need for sustained scalable population level solutions, there is an obvious rationale to continue seeking solutions to physical activity and inactivity in the context of the workplace. The following sections provide an overview of the evidence relating to physical activity in the workplace with an emphasis on summarising the key systematic reviews.

Increasing physical activity in the workplace setting

Despite a strong case having been made to advocate successfully for workplace physical activity policy, systematic reviews over the past 25 years, have shown limited evidence of efficacy or effectiveness.

Dishman et al. (1998), in one of the earliest meta-analyses of workplace physical activity, found that there was no little to no effects on health outcomes from the 26 included studies. Dugdill et al. (2008) found 14 studies additional to the Dishman review. Overall, their review concluded that there remained relatively few high-quality studies. They did though find evidence that walking interventions with goal setting and self-monitoring increased step counts.

Abraham and Graham-Rowe (2009) used 55 unique interventions in their systematic review and found evidence that interventions with a focus on physical activity as opposed to general workplace health, were more likely to increase physical activity. Similar to Dugdill et al. (2008), they also found evidence that walking interventions were more effective than general physical activity interventions and that those which included goal setting and goal reviews were likely to enhance outcomes.

To, Chen, Magnussen, and To (2013) systematically reviewed worksite physical activity interventions where BMI reduction was one of the health indicators. They found that 60 percent of the included studies showed improvement in at least one of the health outcome indicators. However, they commented that few studies showed that changes were sustained over time. They concluded that the interventions that were more effective, included pedometers, the internet and addressed the social and environmental aspects that could affect sustained behaviour change.

Despite a growing body of interventions in workplaces, more recent systematic reviews (Malik et al., 2014), (Lock, Post, Dollman, & Parfitt, 2020), (Muir et al., 2019) similarly were unable to conclude anything significant about the efficacy or effectiveness of physical activity interventions in

workplaces. All concluded that workplace physical activity interventions required more theory-informed design and more rigorous research.

Whilst these reviews provide some insights into what works, they point towards specific physical activity rather than general workplace health promotion intervention. Within the physical activity interventions, those that included walking, step-counting, goal setting and goal review were likely to be more efficacious (Lock et al., 2020). Further, interventions that addressed wider social and environmental conditions, were more likely to show sustained outcomes after the end of the active intervention.

The importance of social and environmental context was also found in the WHO/WEF (2008) review which noted that "Importantly, research has shown health behaviour decisions are affected by social context in which they are made, such that the social support and social norms surrounding a particular health issue has a substantial impact on how that health behaviour is perceived" (p.5) (Quintiliani, Sattelmair, & Sorenson, 2008). Despite this, Mullane et al. (2017) found "significant reasons to believe that social and ecological contexts were diverse and relevant, but largely excluded from trials" (p.8).

Walking interventions in workplace settings

This general conclusion found in the above systematic reviews of limited evidence as well as limited evidence of effectiveness has been found also in relation to walking programmes in a workplace context. Ogilvie et al. (2007) in their systematic review of walking interventions in all settings found that "the balance of available evidence about [walking] interventions applied at the level of the institution (workplace or school), community, or area is less convincing; evidence that these have led to a significant overall increase in walking typically depends on isolated studies or subgroup analysis" (p.7).

Freak-Poli et al. (2020) is the only systematic review of step counting interventions in workplaces. As reported earlier in this chapter, it concludes that "overall there was insufficient evidence to assess the effectiveness of pedometer interventions in the workplace" (p.2).

However, after this review, several large-scale trials of workplace walking interventions have been published that offer some evidence, insight and learning, with some of these reporting their findings in the past year and providing the most up to date understanding.

Haslam, Kazi, Duncan, Clemes, and Twumasi (2019) demonstrated in their quasi-experimental study (tailored, standard and control) in 10 UK workplaces across two years that a tailored walking intervention was more effective than a non-tailored intervention. The tailored intervention group had significant reductions in BMI and reduced waist size. However, they also found positive outcomes in both the standard and the tailored group in relation to reduced sitting time as well as higher scores in relation to job satisfaction, job motivation, organisational commitment, and reduced intention to quit. They concluded that "physical activity interventions have a positive impact on employees' job attitudes and psychological wellbeing" (p.38).

The UPnGO study (Lau & Faulkner, 2019), which is a 6week step counting intervention developed by ParticipATION in Canada, has also reported significant levels of increased step counts, but only in certain high implementation contexts. Their conclusions are that "establishing the linkage between the level of implementation and program outcomes can help identify the active ingredients that contribute to the observed effects" (p.194). Again, this points to the complexity of the workplace context and the need to understand that context to measure and improve interventions.

Numerous other workplace walking interventions using self-reported step counts (Smith-McLallen et al., 2017), (Butler, Clark, Burlis, Castillo, & Racette, 2015), (Macniven, Engelen, Kacen, & Bauman, 2015) have also reported increased step counts. This includes the study by Niven (2015) of the Step Count Challenge that measured self-reported time spent walking and sitting. Participants reported an increase in walking for transport and for leisure as well as a reduction in time spent sitting.

Whilst many of these studies do not have the research design or power to enable their authors to draw strong conclusions about the effects of the interventions, they nonetheless indicate that there is something that is worth further exploration and attention. In the case of these workplace walking interventions, they indicate that there could be impacts on both activity levels and sitting time and that interventions that are more tailored and aligned to individuals may have greater success in achieving some health outcomes than those that don't.

Taking the literature together, there is also a strong suggestion that interventions that do not take account of context (both social and ecological), may not have the ongoing or lasting changes required. In their study of the socio-ecological correlates of workplace sedentary behaviour, Mullane et al. (2017) found that associations of activity and sedentary behaviour "vary by job type and sector and should be considered in the design of workplace interventions" (p.1).

However, there are also often-cited workplace and business outcomes for why physical activity might be provided through a workplace. The following section reviews the evidence relating to these workplace outcomes.

Physical activity and workplace related outcomes

The case for protecting and improving the health of employees is generally centred around a few arguments: ensuring employees remain healthy and avoid sickness absence, increasing retention and reducing staff turnover, improving staff productivity and appealing to potential new recruits (Quintiliani et al., 2008). In countries where employers contribute to staff health care costs, there is also a direct financial incentive to reduce these costs. More recently, the report by Deloitte (2018) shows increasing expectations from employees that employers will support staff with packages to enhance and protect their wellbeing, in acknowledgement that work itself is stressful.

I found only a limited number of reviews of physical activity and work-related outcomes, with the most in-depth studies also now being quite dated. In general the authors advocate for continued intervention in workplaces based on some promising single studies and solid theories. However, there was limited evidence of effect or effectiveness in the reviews themselves.

Proper et al. (2002) systematic review of the effectiveness of physical activity for work-related outcomes considered the evidence for absenteeism, job satisfaction, job stress, productivity, and employee turnover. Overall, they found a lack of published studies of high enough quality for inclusion. Among those studies that were included, they were able to state that there was some small positive effect of physical activity on absenteeism. These conclusions mirrored the Dishman et al. (1998) review which found little or no effects of physical activity intervention in workplaces, largely due to few and poor studies which did not meet the inclusion criteria for their review.

More recently, Naczenski, de Vries, van Hooff, and Kompier (2017) review of the links between physical activity and burnout, found strong evidence to support the link between physical activity interventions and reduced exhaustion. Given that persistent exhaustion is a driver of burnout they were able to comment positively on the association. However, in common with previous reviews, they recommended caution given the small number of included studies.

However, others (Pronk & Kottke, 2009), (Pronk, 2009), (Batt, 2009), (Ryde & Brown, 2017) have advocated strongly for the potential value of physical activity to deliver work-related outcomes, principally presenteeism and absenteeism. They have based their recommendations for workplace physical activity policy and programmes largely on promising single studies and systematic reviews of general physical activity and health-related outcomes. In the case of the latter, links to common causes of work-related illnesses such as musculo-skeletal health and stress have been used to advocate for the value of intervening.

Given that 65 percent of the world's population, over the age of 15, are part of the global workforce (World Health Organisation, 2008), it is not surprising that both world health and world economic bodies consider workplaces as relevant settings for intervention to prevent NCDs, including addressing physical inactivity, regardless of the low volume and quality of evidence available. With policy based on strong advocacy for workplace physical activity, the challenge is to identify and implement effective interventions that deliver change.

Those leading on implementation are likely to require a different kind of research to that used to make the case to policy makers. As such their interests may well lie in the messier questions of 'how do physical activity interventions in the workplace work?' as well as 'how can we improve the practice we have?'.

Conclusions and recommendations for study design

Trials and systematic reviews are generally regarded as 'gold standard' research approaches in public health research (Craig & Petticrew, 2013) and they form the backbone of clinical and public health guidance. However as physical activity is a complex behaviour and workplace is a complex setting, it is perhaps unsurprising that these approaches have been unable to deliver the kind of understanding to improve physical activity programme design and delivery for workplaces.

Despite this, there has been advocacy by academics as well as a general health promotion strategy to invest in the potential of physical activity to deliver both health and workplace-related outcomes. This advocacy appears to have been based largely on the strength of the case that has grown and is now well-established for the links between physical activity and health (both physical and mental health). This evidence has been attractive for policy makers as many of the links between physical activity and health outcomes plausibly would address reasons for workplace sickness absence and low productivity. The workplace also is a plausible location to reach and engage adults of working age.

Based on the literature summarised above, it seems that policy makers have accepted this case for physical activity in the workplace based on highly plausible, but arguably not well articulated or documented, theories. In the absence of robust evidence, programme theories can be a very helpful and credible way to design and improve programmes. **There is therefore a need to articulate a strong programme theory for workplace walking programmes.**

Overall, physical activity interventions in workplaces have not yet demonstrated significant evidence of effectiveness and remain challenged by a relatively small pool of interventions that can meet the requirements for inclusion in most systematic reviews. This has led many reviews over the past 20 years to recommend the need for more 'gold standard' scientific method studies to address the gaps. However, what has been clear among the single studies that meet 'gold standard' trial designs is that is that few have been able to incorporate the complexity of trying to intervene in workplace settings to increase physical activity or walking.

There was no evidence in the physical activity literature I read that those studies from outside the area of public health have been used to inform or shape public health intervention in the area of workplace walking. However, Cherniack and Lahiri (2010) from an economics perspective, raises interesting questions about how the health case for workplaces is strong but the potential for real costs savings for businesses is less clear. Their research showed that there is significant misalignment between who pays for health interventions (for example current employers) and who benefits from this (future employers or society more generally). They comment on how "intervention and outcomes research will be insufficient, if divorced from valuation mechanisms, and if structural barriers are not dismantled" (p.941).

Similarly, Green in her sociological study of walking suggests that a broader sociological perspective on walking would help public health to frame "how different kinds of walking are experienced within structurally determined frames" (p.35). This would also acknowledge that walking has a 'political' component and that the resources available to walk can be unequally distributed.

This review has therefore identified that studies that seek to understand how workplace walking programmes work **need to adopt a broad view of what might facilitate or explain behaviour in a workplace context and include, for example social, environmental, and cultural explanations.**

Summary

In this chapter I established that there is strong evidence for the links between physical activity, walking and health. I also concluded that research on walking in workplace settings is limited and when subjected to traditional systematic review processes, often falls short of the required levels of rigour to be included. Together, these indicate both an absence of evidence that walking in workplace settings is effective way to deliver health outcomes as well as limited evidence of effectiveness. However, workplace walking has emerged based on the strong plausibility that it could be effective.

I concluded that studies, such as mine, that seek to understand and improve workplace walking programmes can usefully build stronger programme theories and draw on a wider range of literature and disciplines in the search for explanatory evidence. As such, it was proposed that a realist research approach would offer a good fit for this study, and I explain why this is the case in the next chapter. It's strong focus on systematic application of method is increasingly used in clinical health improvement research (Greenhalgh et al., 2009) and its specific goal is the development of stronger programme theory.

Chapter Three: Theoretical perspectives and methodology

Introduction

In the previous chapter I identified and argued for the need for stronger programme theories and for greater analytical richness and depth to better understand how workplace walking programmes produce their effects. In that context, realist evaluation was proposed as an appropriate research approach. This chapter sets out the paradigm (realism) and the methodology (realistic evaluation) at the heart of the research approach adopted in this thesis.

In the section on theoretical perspectives, I set out the key tenets of critical realism and scientific realism. These are presented in brief for the purpose of locating the research approach in an historical and evolutionary context. This context helps us to see how realism developed, both in terms of what it rejected about other social theories and sciences and what it contributed in terms of new thinking and constructs. I also refer to debates about these themes within the field of public health research. This chapter also considers the implications of realist thought as a particular form of social science with implications for the field of evaluation.

In this section, I also clarify the different types and levels of theory and how these influence thinking and practice in realist evaluation. In the section on methodology, I outline the realistic evaluation approach of Ray Pawson and Tilley (1997) and locate this as an applied form of theory-driven evaluation. I include a discussion of the core constructs in realistic evaluation and comment specifically on their interpretation and value in the context of this thesis.

Theoretical perspectives

Theory exists at different levels of abstraction and influences both how we think about social problems as well as how we design ways of learning about these problems. I will outline my understanding of these levels and types of theory and then explain how they have influenced and been used in this thesis. I have chosen to illustrate these in Figure 2 using the model by Shearn, Allmark, Piercy, and Hirst (2017), as I found this a helpful illustration of how the theories relate to each other and are connected in realist evaluation through the processes of guiding, directing, testing and refining.

Grand theory (Mills, 2000)

Grand theories are largely untestable theories that have been developed to organise large bodies of knowledge. They can be normative and ideological (such as Marxism or Feminism) and/or they can, bring together related bodies of knowledge (such as Functionalism and Post-Modernism). Grand theory influences entire perspectives about how things are or how they should be and, as such, they guide how mid-range theories are constructed.

Mid-range theory (Merton, 1968)

Mid-range theories are less abstract than grand theories and are developed to be empirically testable. Mid-range theory links empirical observations with grand theories by offering reasonable interpretations of what has been observed. In the context of realist research, Shearn et al. (2017) illustrates how mid-range theory is also often referred to as ‘substantive theory’, that is a theory that describes how something works (a theory of action) in a specific context. Behaviour change theories are substantive or mid-range theories, and they may direct the design of a programme theory.

Programme theory (Funnell & Rogers, 2011)

Programme theories set out how interventions are supposed to work to achieve their goals. They are largely valuable for setting out the details of a programme for the purpose of evaluation. By specifying the details about how the programme works, evaluation can establish where an intervention is working and not working. Programme theories are often described using models and diagrams to illustrate processes and one of the most common diagrams is referred to as a logic model.

Realist programme theory (Ray Pawson & Tilley, 1997)

Realist programme theory is distinctive in that it has a focus on the underlying mechanisms of change and the relationship of these mechanisms to specific contexts. Realist programme theory is a specific configuration where contexts (C) trigger mechanisms (M) which in turn lead to programme outcomes (O). Realist programme theory is therefore not expressed in the type of logic models often found in other forms of theory-led programme evaluation but rather as C+M=O.

The following diagram is taken from Shearn et al. (2017) (p.13) and illustrates the relationship between these levels of theory and their relationships in realist research.

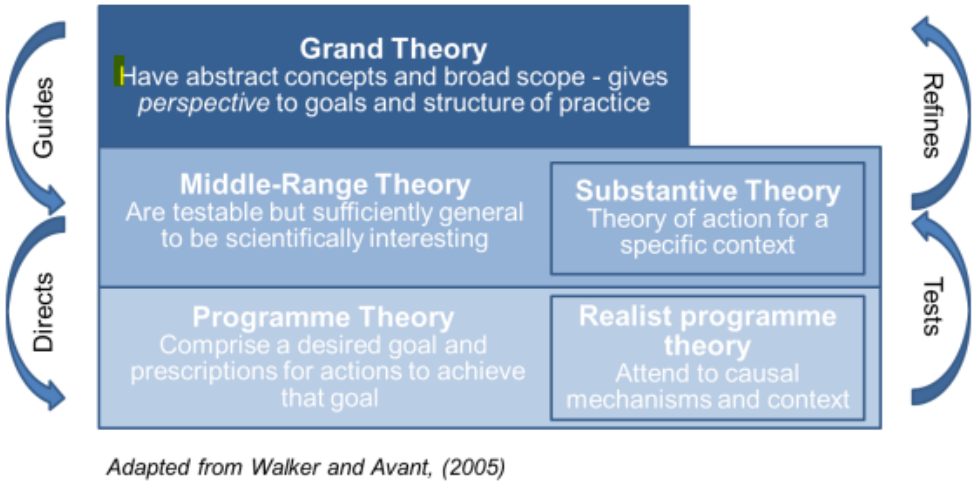


Figure 2: Relationships between grand, middle and programme theory

The foundations of realist thought

It is important to recognise that "all evaluation approaches – consciously or unconsciously – reflect deep philosophical assumptions" (Westhorpe, 2014) (p.4). These philosophical assumptions drawn from grand theories inform how we think about the nature of reality (ontology) as well as how we believe we can know and understand that reality (epistemology). Crucially for evaluation research that considers behaviour change, philosophy also informs and influences our thoughts on what causes change to occur (the nature of causation).

Traditional research approaches tend to divide into those which believe the world can be objectively known and measured (positivist) and those which believe that it can only be experienced and interpreted in subjective ways (non-positivist or interpretivist). These philosophical views then tend to influence the way in which research is conducted based on these views. Positivist research design commonly relying on quantitative methods such a trials and experiments and interpretivist research using mostly qualitative methods.

Realist research is unusual in that it draws from both positivist and interpretivist perspectives. Realist research combines the ontological philosophy of positivism with the epistemological philosophy of interpretivism. It is of relevance to this thesis to understand that there are two main strands of realism – critical realism (Collier, 1994), (Archer, 1995) and scientific (or empirical) realism (Ray Pawson & Tilley, 1997). Both emerged in the latter part of the twentieth century as a response and reaction to the increasing complexity of the social world and to the limitations of the science used to understand it.

Critical realism

Like many social theories, critical realism, studied in-depth, is neither particularly accessible or without nuance and debate (Sayer, 2000). For this thesis, my position is to summarise modestly some of the key tenets of the critical realist theory. It is perhaps Archer (1995) who describes the thinking of critical realists, most accessibly. She explains (Archer, 2014) that the theory is a critique of the sociology of late modernity such as that set out by Durkheim, Habermas, and Mead. She describes how, in the late 20th century, society 'opened up' globally, through accessible media and emerging new forms of families and relationships, to the extent that there were fewer possibilities to determine how the social world and social thought was produced. The idea of an open social system with significant interaction and dynamic sources of causation, and an inability to determine outcomes are important to the critical realists' world view (Sayer, 2000).

Bhaskar (Collier, 1994), who is generally regarded as the founder of critical realist thought, has described this open social world as having three layers: the real (causal mechanisms that operate independent of our perceptions), the actual (events and experiences caused by the mechanism of the real) and the empirical (the things we experience through observation). These layers of experience and perception are sometimes portrayed as an iceberg (Justin Jagosh, 2017), with the tip being the empirical, the actual being the portion beneath the water and the real being the processes of currents and weather that shape both of these.

With this metaphor in mind, it was then easier for me to understand how critical realists can embrace the ontological position of positivism, as it acknowledges the world can be known and includes empirical elements. However, it is also possible to understand how critical realists embrace the interpretivist epistemology required to offer insights into how perceived activity in the real (as defined by Bhaskar) may shape and determine the outcomes of the empirical. It is therefore theories about causality and the dynamic nature of how things are determined that shape and inform the science of critical realism (Collier, 1994), (Archer, 1995).

Scientific realism

Scientific or empirical realists (Ray Pawson, 2006b), embrace Bhaskar's proposition that "theory without experiment is empty and experiment without theory is blind" (Bhaskar, 1978) (p191). This dualism is a way to understand the positivist ontology and interpretivist epistemology of the critical realist. Scientific realists also subscribe to the view of Archer (1995) that society is 'morphological'. That is, that society comprises constant interactions at all levels that produce changes at and between these levels, and consequently, outcomes cannot be pinned down as final truths, as they are constantly evolving.

However, scientific realists believe that despite the dynamic and infinite nature of social interaction and the hidden nature of causation, through the development of theory and the use of rigorous science to test these theories, it is possible to understand and interpret the social world, at least partially. It is in this respect that scientific realist thought is different from critical realist thought as

it has greater emphasis on the scientific application of the philosophy and how we can understand the world through rigorous interpretation.

Implications of realist thought for approaches to evaluation

Within the broad endeavour of research, 'evaluation' is an approach that addresses applied questions about the social world. Rossi (in Alkin (2004) p.110) has summarised this as having three critical components. His summary defines evaluation as:

- applied to answering policy-oriented questions,
- aiding stakeholders in their decision-making on policies and programmes, and
- involves making judgements.

The proposition that evaluation is used for 'social accountability' (Alkin, 2004) has been relatively enduring. However, the question of how comprehensive evaluations can be is based on debates about methods and epistemological debates about the limits of what can be known. Many of these debates derive from the basic philosophical positions that were described in the previous section.

Given that the epistemology of positivism is viewed as oppositional to a realist epistemological position (despite sharing an ontological view) it is worth saying a little more about these differences in an applied evaluation context. It is these differences in thought that distinguish the realist approach.

Positivist approaches to evaluation

In simplistic terms, a positivist approach to evaluation assumes that all variables can be objectively measured. This kind of evaluation would identify the range of variables that could lead to the observed outcomes in a policy or programme. These variables are then measured independently against the outcomes. Variables that consistently demonstrate a strong relationship to the outcomes would be deemed to be the factors causing the outcomes. (Sayer, 2000).

This is a successionist view of the world (The RAMESES II Project, 2017a), inferring cause from the repeated observation of independent variables and their relationship to outcomes. This approach lies at the heart of experimental approaches, such as randomised control trials (RCTs). The validity of this approach lies in the accurate measurement of what is set out to be measured. For this reason, the publication of protocols is central and prominent with this kind of evaluation. This enables others to replicate the study precisely, removing their bias and adhering to the strict rules that allow for accurate and independent observation. The replication allows for further generalisation based on more and more observations.

There is an ongoing debate (Bonell, Fletcher, Morton, Lorenc, & Moore, 2012), (Bonell, Moore, Warren, & Moore, 2018), (Marchal, van Belle, van Olmen, Hoerée, & Kegels, 2012) about how those working within a realist paradigm have defined and interpreted positivism. This has led some academics to question of whether all RCTs are inherently positivist or whether in fact RCTs could be developed to be more realist inspired. This is an interesting debate that is ongoing and currently seems confined to a few institutions and researchers. It is worth noting that the polarised opinions of positivist versus realist may not be quite a polarised as has been asserted by those at the heart of developing realist research standards.

What is agreed though is that positivist evaluation design is generally used to address the question 'Does A lead to B?' In a real-world scenario, this approach could be used to answer the question 'does the Step Count Challenge improve health?' or even more specifically, 'does the Step Count

Challenge improve health more or less than another currently used physical activity programme?' Relating back to the basic philosophical position of positivism, this approach takes the view that the world under observation can be 'controlled' to ensure that the experimental approach has 'internal validity'. (Ray Pawson, 2013)

This positivist position, that the bias of the researcher (their personal beliefs and perceptions of the world) can be removed through carefully designed research methods, is rejected by realists. Realists believe that reality can only be understood through the interpretation of researchers using mixed methods of inquiry. Realists therefore stand in support of the view that "what causes something to happen has nothing to do with the number of times we observe it happening" p.14 (Sayer, 2000). Rather, they believe in a notion of a generative causation where the 'real' generates the 'actual' and which may or may not be measurable through the 'empirical' (Collier, 1994)

Non-positivist approaches to evaluation

A range of non-positivist stances such as interpretivism, hermeneutics, and phenomenology emerged in the 1970s (Ray Pawson & Tilley, 1997). Pawson and Tilley have broadly grouped these approaches, and other similar non-positivist thinking, under a banner of constructivism.

Constructivism is a belief that reality is socially constructed through our perceptions of that reality. From a constructivist stance, reality cannot be known as facts or truths, only as perceptions and interpretations. From an epistemological position, constructivists believe that reality can be given meaning and interpreted using our understandings and experiences of that reality. This is a view shared by realists and leads to the belief that "all enquiry and observation are shaped and filtered through the human brain and that there is, therefore, no such thing as 'final' truth or knowledge" (p.4) (Westhorpe, 2014).

Realist approaches to evaluation

In contrast to the positivist approach, a realist approach to evaluation is used to answer a different kind of question. The focus of a realist approach is 'How does the intervention lead to the outcomes?'. This realist approach to evaluation is focussed on explaining how a programme or policy produces effects rather than whether and to what extent it produces effects (Ray Pawson & Tilley, 1997). In a realist approach this is described as what is it about X (the context) that gives rise to Y (the mechanism) that delivers the result Z (the outcome).

As such, realist approaches understand complexity is a part of the context and affects how the intervention operates. Rather than seeking to avoid adaptations and variations to the interventions through strict protocols, a realist evaluation would use these variations as data. These data would help understand and explain 'what might be working for whom and under what conditions'.

This approach acknowledges that outcomes from social policies and programmes are emergent and are generated from the interaction of many things. As Sayer (2000) notes, "we are embodied beings and the interaction of the physical with the social needs to be acknowledged" (p.14). This idea of 'generative causality' is central to the realist approach to evaluation.

It is the concept of how change happens (causality) that is distinctive for realist approaches. Realists see the natural and social world as connected and co-existent in an entirely open system. In this kind of systems-thinking view of the world, programmes exist in dynamic and ever-changing relationships. As such, programme outcomes are not uniquely attributable to programmes. Outcomes are the result of mechanisms operating in specific contexts.

Realist methodology

Methodology is “a ‘contextual framework' for research, a coherent and logical scheme based on views, beliefs, and values, that guides the choices researchers [or other users] make" (Kara et al, 2015, p.4) in relation to their research questions and methods. The methodology adopted for this thesis is one of realistic evaluation (Pawson and Tilley).

Whilst researchers may have undertaken research within the paradigm of realism, the specific methodology of realistic evaluation was first set out by Pawson and Tilley (1997) in their book of the same name (‘Realistic Evaluation’). The book was referred to as a ‘manifesto’ for a ‘new evaluation paradigm’ grounded in scientific realist philosophy (p.xiv). The methodology stood in stated opposition to the growth of pluralist approaches to evaluation and set out a defined and prescribed set of principles.

However, just as realistic evaluation methodology was rooted in grand theories of realism, the real and the realistic underpinning was drawn from a broader school of theory-driven evaluation approaches. Real being rooted in the interactions between individuals and the resources available to them and realistic being the need to circumscribe the applied social programme or policy to which the evaluation was being applied.

Theory-driven evaluation

In practice, evaluators often need to answer a range of questions about the programmes and policies which they study. The purely experimental approach will often find ‘no effect’ because only a narrow causal relationship, with strong internal validity has been looked for. Similarly, a broader exploratory research approach may uncover important contextual details but may not be able to generalise about programme or policy efficacy (Ray Pawson, 2013).

Chen and Rossi (1980) acknowledged these dilemmas when they set out a proposed approach to what they called ‘a Multi-Goal, Theory-Driven Approach to Evaluation’. Chen and Rossi believe that “every programme has some effects” (p.107) and that “a priori knowledge and social science theory can adequately anticipate the effects that a given social programme can be expected to have” (p.108). This more comprehensive approach to evaluation proposed by Chen and Rossi sought to reconcile the need for what Weiss has called “careful and sound research” (Weiss, 1998), with what Scriven (1991) has called “goal-free evaluation”.

By setting out a theory of all possible goals that a programme could potentially meet (using theory-based assumptions), Chen and Rossi (1980) believed that there was a greater chance of identifying and valuing aspects of programmes and policies, including their unintended consequences. Chen’s (1990) combination of a ‘change model’ (what is expected to happen in a programme) with an ‘action’ model (what needs to happen) is the basis for theory driven evaluation, which starts with the endeavour of building a programme theory.

Programme theory in evaluation

Programme theory is about understanding how a programme, often referred to as an intervention, is intended to work. Weiss (1998) states that evaluators “… should understand exactly how the program expects to bring about the required change” (p46). In the case of the Step Count Challenge, this would mean knowing not only whether participants had increased their daily step count (a measure of outcome), but also the factors that led to the behaviour change. The latter requiring some understanding of inputs, processes and outputs that lead to, or influenced, the outcome of a changed behaviour, such as more walking or less sitting.

By including components of behaviour change in a programme theory, Funnell and Rogers (2011), building on Weiss (1998) earlier work, demonstrate how evaluation is then more useful. They argue that conclusions can be drawn not only about the simple metrics of outcomes but also deeper understanding about partial successes and failures. It is often these partial successes which provide powerful insights for ongoing programme learning and improvement.

Funnell and Rogers (2011) point out that programme theory must include the theoretical components of a programme – that is the causal aspects of how a programme works. These programme theories often are set out visually using a variety of diagrams to illustrate the stages and links between aspects of programmes. The diagrams themselves are often referred to as 'logic models' and can take a variety of formats depending on the purpose and audience for the evaluation, as well as the underpinning philosophical approach to the research (Anderson et al., 2011).

In the case of realist evaluation, the generative or causal mechanisms are more explicit than other programme theory approaches (Dalkin et al., 2015). Further, given that the mechanisms can differ depending on the context of the intervention, realist evaluation is also more explicit about context/s (The RAMESES II Project, 2017b) .

However social programmes are rarely simple, being frequently complicated and often complex (Funnell & Rogers, 2011). As Weiss (1998) notes "programs are not likely to be laid out in rational terms with clear cut statements of why certain program activities have been selected and which actions are expected to lead to which desired ends." (p.55). For this reason, researchers often find that their first task is to elicit the programme theory or theories.

There are a variety of ways in which researchers can approach this task. Funnell and Rogers (2011) have grouped these into three broad approaches; inductive, deductive and/or based on mental models of those involved. Inductive work would involve reaching an understanding of the programme theory through reading and analysing materials about the programme such as reports and reviews and may also involve discussions with stakeholders and those who designed the programme. Deductive approaches would involve seeking to elicit the programme theory through consideration of evidence from similar programmes such as research publications and systematic reviews. The third approach would involve asking stakeholders and participants to explain how they believe the programme works – sometime referred to as the 'mental model' or 'mental map'.

Although these approaches are conceptually different ways of understanding the world (as empirical, actual or real), in practice they are not mutually exclusive. In the case of realist evaluation, there is a favouring of a mixed method approach and a requirement for stakeholder engagement to scope out the initial, rough programme theory (Wong, Greenhalgh, Westhorp, Buckingham, & Pawson, 2013). It is also clear within the realist approach to evaluation that programme theory is not a static set of assumptions but rather is a constantly evolving understanding based on iterations of realist reviewing, data gathering and analysis. Given Pawson's assertion that "programmes are theories" (Ray Pawson, 2003), the entire endeavour of realist synthesis and evaluation is to refine and improve that theory.

Core constructs in realist programme theory

There are three core constructs in realist programme theories: context, mechanism, and outcome (CMO). Taken together these three constructs are developed, configured as a CMO theory, and tested to create the programme theory. As with most realist methodology, these constructs were first described by Pawson and Tilley in 1997 and have subsequently been refined by others working

with realist methodology (Dalkin et al., 2015), (de Souza, 2013), (Shearn et al., 2017). The refinements have not changed the basic constructs though and realist methodology still see all three (in specific configurations) as central to the realist approach.

Context

Social context is complex and de Souza (2013) elaborates on the key dimensions of structure, culture, agency and relational contexts, in thinking about realist approaches. In a more generic paper about the role of context in implementation science, Pfadenhauer et al. (2017) offer seven domains of context with which programmes will interact in their implementation: geographical, epidemiological, socio-cultural, socio-economic, ethical, legal and political.

Contexts also exist at different levels: macro structures such as the economy or country; meso levels such as a neighbourhood or workplace culture and at micro levels such as personal relationships or values. Important to understanding the realist approach is that contexts also interact. All the above kinds of context are both independent and interdependent, shaping and being shaped by contexts. Realist methodology acknowledges that contexts pre-exist the programme and can change over time in relation to the programme. They reflect the morphological and multi layered nature of society as described by critical realists.

Given this definition of context is dynamic, it is helpful to understand what realist approaches do not regard as context. According to The RAMESES II Project (2017b) "contexts do not refer to places, people, time or institutions per se, but to the social relationships, rules, norms and expectations that constitute them, as well as the resources available (or not)" (p.3). Given it is generally common in workplace physical activity research to report context as empirical context (offices, locations and layouts), it is perhaps helpful to dig even deeper into what may be going on in the actual and the real context too.

Lacouture et al (2015, p.6 and derived from Macfarlane et al, 2011) described four layers of context that they believe shape social programmes:

- Individual capabilities of the key actors to take things forward (values, roles, knowledge, purpose)
- Interpersonal relationships supporting the intervention (communication, collaboration, networks, influences)
- Institutional settings (informal rules, organizational culture, leadership, resource allocation, local priorities)
- The infrastructural system (political support)

From a realist perspective there is no definitive 'checklist' of contextual factors, simply a requirement to delve deeply (Justin Jagosh, 2020) into the relevant contextual factors that may exist relevant to goals of the programme. In the case of a workplace walking programme that could include travel and transport, the nature of work, the culture of the workplace etc. We could then use these to theorise about how programme-related changes might occur in some contexts and not in others, or to a greater or lesser extent, given the range of contextual dimensions that could be at play.

It is not only important to understand how a realist approach to evaluation defines contexts. Of interest to the methodology is that contexts themselves work to enable or constrain outcomes. As The RAMESES II Project (2017b) has summarised, contexts can affect outcomes in the following ways:

- Affect our reasoning (for example our culture or gender affects how we think about responding to resources)
- Affects how things get done (interventions get added to existing services and systems)
- Affects whether resources are available for people to put decisions into action.
- Operate in specific times – yesterday may be different to today or next year.

In realist methodology therefore it is the context rather than the intervention that is a major focus of attention. Realist methodology contains the belief that the context, such as a workplace culture, contains the conditions that the intervention seeks to change. For this reason, one of the principal components of realist programme theory is Context (C).

Mechanism

The second key component of realist programme theory is Mechanism (M). Mechanism is a is a concept that is central to theory-driven evaluation (Chen, 1990) in that it has a focus on what it is about an intervention that drives the change which happens between intervention activities (inputs) and the outcome of the intervention. It is important to programme theory development to understand that the mechanism is not the activities of the intervention, nor is a mechanism the relationship between observed variables (Astbury & Leeuw, 2010). A mechanism, from a realist approach, is what generates the relationship between variables (Dalkin et al., 2015). These mechanisms are "underlying entities, processes or structures which operate in particular contexts to generate outcomes of interest" (p.368) (Astbury & Leeuw, 2010).

The classic and short definition of a mechanism (Pawson and Tilley, 1997) is that mechanisms are:

- Hidden but real.
- Shaped by context.
- The interaction between programme resources and the reaction to those resources.
- The explanation of how and why programmes generate outcomes.

Building on the work of Astbury and Leeuw (2010), Lacouture, Breton, Guichard, and Ridde (2015) propose a more detailed definition. They propose that mechanisms are:

- Hidden but real (exist prior to the intervention (latent), a causal mechanism reveals itself in the implementation in a set context, sensitive to the variations in context at micro, meso and macro levels and produces expected or unexpected outcomes).
- An element of reasoning and reactions of an individual or collective agent in regard of the resources available in each context to bring about changes through the implementation of an intervention.
- Evolves within an open space-time and social system of relationships (multiplicity and temporality – exist before and after intervention, affected by other interventions).

Possibly because of mechanisms' abstract and hidden quality, "debates about a finer grained understanding of this concept are an ongoing feature of realist literature" [What is a mechanism, p2). There are also active debates among realist evaluators about how best to conceptualise mechanisms (Dalkin et al., 2015), (Marchal et al., 2012) and whether the original conceptualisations by Ray Pawson and Tilley (1997) are in fact easy to operationalise in applied evaluation.

These recent studies have extrapolated and explored different visualisations of the core CMO concepts. Dalkin et al. (2015) extrapolated the concept of mechanism to address the reasoning of participants to the responses of the programme, which was implicit in Pawson and Tilley, but not explicitly located or configured within the mechanism. In extrapolating the concept of mechanism,

Dalkin et al (2015) also set out the importance of its conceptualisation as a continuum, rather than a binary present/not present component.

J. Jagosh et al. (2015) studying community-based partnerships and research, explained and illustrated a 'ripple effect' in the configuration of CMOs, showing how the initial configuration led to other configurations over time, thus helping with the common challenge of how at times a mechanism in one analysis could be a context in another. Marchal, Kegels, and Van Belle (2018) added explicit consideration of 'intervention' (I) and 'actor' (A) into their configuration to create ICAMO configurations to help reinforce that the intervention is not the mechanism and that the consideration of 'for whom' could be more prominent in configurations.

Whilst these examples illustrate the ongoing refinement of the realist approach, none detract from the core realist conceptualisation of what a mechanism is and its centrality in the theory-driven approach of realist methodology.

Outcomes

Pawson and Tilley (1997) explain that all interventions contain the possibility for individuals to access ways of changing their behaviour, if the right set of circumstances is presented at the right time. As such all interventions, in theory, can work (and not work) but often only for some people in some contexts. For this reason, the focus of realist methodology is about uncovering and understanding these interactions and less so on whether a priori outcomes were delivered or not.

Pawson and Tilley (1997) emphasise that realist methodology approaches interventions in terms of these specific 'contexts' (C) and 'mechanisms' (M) in relation to specific 'outcomes' (O) and therefore realist programme theories are modelled as specific configurations of CMO. Approaches which have grouped a range of contexts and mechanisms, and their role in relation to programme outcomes more generally, have been criticised (Ray Pawson & Manzano-Santaella, 2012). Part of the reason for the criticism is that to fail to construct context, mechanisms and outcomes in specific configurations is to fail to understand the nature of these core constructs from a realist methodological perspective.

Conclusions: A place for realist methods in physical activity research

Like many other paradigms, realist philosophy is rooted in its reaction to the adequacy of the conventional wisdom and methods of the times to address the issues being faced at those times. Realist approaches acknowledge that the world is not only complicated (having many parts) but is in fact increasingly complex (having properties which are emergent and uncertain) (Glouberman & Zimmerman, 2016) and morphological (Archer, 1995).

This philosophical stance seems to chime with contemporary ecological models of physical activity (Bauman et al., 2012). These models, like the Whitehead and Dahlgren (1991) model of the social determinants of health, acknowledge that the outcomes of good health are embedded in complex and dynamic interactions between individuals, communities, and their socio-cultural and economic contexts.

The philosophy of realism also seems relevant to support the systemic and ecological approaches advocated in the World Health Organisation's Global Action Plan on Physical Activity (2018), the National Walking Strategy for Scotland (Scottish Government, 2014) (Campbell, Calderwood, Hunter, & Murray, 2018). It does this because it offers a way of understanding the complex interplay between social, environmental, and individual factors, and how each of these may play a role at different stages and in different ways for different participants. As a methodology to support ecological models and global strategy in physical activity, realist methodology appears to be a good

fit as they share similar philosophical standpoints. **There is an opportunity to apply realist methodology to an ecological approach to physical activity and to explore this relationship further.**

However, realist methodology's epistemological commitment to the value of interpretivism is unlikely to endear the approach to those who believe in and are committed to a 'gold standard' approach to public health science (Ray Pawson, 2013). Furthermore, because of realist methodology's commitment to a positivist ontological position, it is not an approach that is philosophically comfortable for those working in sociological fields who have made contributions to the field of physical activity and health from perspectives such as feminism. Despite these polarised positions and although it may be challenging**, it may also be valuable to apply a realist approach, document the process and reflect on its value for the field of physical activity more broadly.**

Given the lack of evidence that has been generated from RCTs and the stated need for better programme theories (See Chapter two), I concluded that **a major element of the thesis needed to be the thorough documentation and demystification of the realist approach applied to a physical activity intervention.** To my knowledge, this will be one of the first attempts to demonstrate comprehensively the use of realist methodology in applied physical activity research, certainly in a workplace setting, thereby making a valuable and original contribution to the area.

Summary

In this chapter I have described the overall philosophy of realist research and explained the key theoretical constructs used in its application. I also provided a summary of the seminal studies that have influenced the development of realist methodology and indicated that the field is still one that is evolving. As such, I concluded that the method has much to offer the study of complex health promotion interventions such as the Step Count Challenge and to exploit that fully, it will be vital to thoroughly document the method used and to share this to develop debates in the field. The following chapter therefore provides the applied approach and method. To address the need for thorough documentation of the approach, it does this is more detail than may generally be provided.

Chapter Four: Research focus and methods

Introduction

In Chapter Two I described how there is a plausible theory and some limited data that indicates the inputs of the Step Count Challenge may lead to increased step counts for some participants. I also described how increased step counts may lead to a variety of improved physical and mental health outcomes. This plausibility is based on reviews of studies where the same outcome has been repeatedly observed.

However, in Chapter Two, I also argued that we have limited explanations for how these improved health outcomes are generated through participation in workplace walking programmes. We know relatively little about why they work or don't work, for whom and in what context. As such there is no substantive programme theory for how workplace walking programmes work and limited understanding about how they produce their health effects.

In Chapter Three I explained that realist methodology is intended to provide ontologically deep ways to understand how complex interventions, such as the Step Count Challenge, might produce their outcomes. It was therefore chosen as a suitable methodology to address the gap in understanding identified in Chapter Two.

This chapter now sets out the focus for this research, including the questions posed at each stage, the overall realist study design, the core study components as well as the approach to information management, analysis and ethics. As the study also seeks to adopt the RAMESES II Standards for the conduct of realist evaluation (Greenhalgh, Pawson, et al., 2017) and RAMESES I Standards for the conduct of realist synthesis (Greenhalgh, Wong, Westhorp, & Pawson, 2011) (Wong , Westhorpe, Pawson, & Greenhalgh, 2013), there is also a demonstration of the use and application of these standards.

Given the conclusion in Chapter Three regarding the need for detailed methodological description of the approach used, this chapter contains details that may, in some other theses, be attached in appendices and Chapters Five to Seven contain additional and more detailed descriptions of the methods used in each of the three stages of the study. I hope this will articulate clearly how I have applied the method, as my experience has been that published papers from studies that have used realist methods are rarely afforded the word count to be so explicit.

The focus of the study

There is some limited evidence that participation in the Step Count Challenge (Niven, 2015) and other similar step counting programmes (Haslam et al., 2019), (Lau & Faulkner, 2019), (Butler et al., 2015) can result in increased steps, at least on a short-term basis. We know from evidence, coupled with theory, that increased steps can lead to increased physical activity and that this can lead to a range of health outcomes (Kraus et al., 2019), (Teychenne et al., 2020). These health outcomes include a reduction in the risk of a range of non-communicable diseases as well as promotion of mental wellbeing and social connectedness.

However, there is very little known about is how the Step Count Challenge produces these health effects, and for whom. We also have some insights, from anecdotal evidence, that the Step Count Challenge works differently for different people but there is limited understanding about why. The adoption of a realist methodology and the specific methods are designed to provide both descriptive and explanatory insights and understanding about how the Step Count Challenge works, when it works as well as how these explanations may not apply to everyone in every context who

participates. It is not the intent of this study to reach a judgement about whether the Step Count Challenge works or not.

RAMESES II Standard 1 (Evaluation purpose) requires researchers to demonstrate that a realist approach is suitable for the study and that the evaluation question is framed appropriately to be suitable for realist evaluation. I believe that I have now demonstrated that.

'Doing' realist research and/or 'thinking' like a realist researcher

The overall approach to all realist research is to develop a programme theory or theories, test the theory/ies and to refine the theory/ies (Ray Pawson, 2003), (Ray Pawson & Manzano-Santaella, 2012). This testing and refining can comprise either or both research synthesis/review as well as primary data gathering, usually employing mixed methods (Ray Pawson & Tilley, 1997). Although this appears to be straightforward to theorise, refine and test, it is important to note that many researchers struggle with detailed operationalising of the realist method (Punton, Vogel, & Lloyd, 2016), (Rycroft-Malone et al., 2012) including the data analysis and coding of the programme theories (Dalkin et al., 2015), (Astbury & Leeuw, 2010).

My experience of doing this research involved similar challenges of knowing how to 'do' realist research work in practice and knowing whether what I did was 'correct'. With the benefit of hindsight and three years of working with the method, I now appreciate the view of Gill Westhorpe that "a realist approach is not a method but a way of thinking" (Westhorpe, 2014). The challenge of articulating, documenting and defending my realist thought processes was more challenging for me than describing and justifying the use of tried and tested methods.

However, with this hindsight and increased confidence, I feel that I can now articulate three areas where the realist thought process was most challenging. I have decided to set out these areas here, rather than in a reflections section, as I believe they are important context for how I approached the design and analysis of this thesis. The three areas are: retroduction, iteration and causation.

Retroductive analysis: "Retroduction makes possible a research process that is characterised by the linking of evidence and social theory in a continually evolving, dynamic process"(Sæther, 1998). It is important to understand that the social theories are not all empirically derived, but also those that we hold ourselves through our personal theorising as researchers (Blom & Morén, 2011). Whilst I believe that most researchers will have personal hunches and insights drawn from multiple data sources, it is my personal observation that few seek to openly operate in that way as the major analytical approach and fewer explicitly report this way of working in their research publications. When I worked in this way, it felt unusual and to some extent unclear about what the 'rules' were that I should follow.

Iterative data gathering, analysis and theorising: as a result of retroduction, revisiting initial theories to reformulate and retest is a required approach in realist evaluation (Wong et al., 2013), as is the emergence of new theories. I found that this process felt like a relatively natural way to think about emerging ideas and theories, and it was comfortable to pursue lines of enquiry based on multiple sources of data. However, it is extremely challenging to record and report multiple lines of enquiry as they are refined, re-cast and re-tested almost continuously and often based on personal hunches and small data insights. Again, it is an approach is rarely reported in research publications so initially it was challenging to know if I was 'getting it right'.

Generative causation: the final area that made the realist approach challenging for me to apply was building practical understanding and application of the core concept of generative causation.

Researchers working with a realist approach have reported that it can be challenging to differentiate clearly between contexts and mechanisms as there can be chicken and egg scenarios in terms of what generated the observed change (Lacouture et al., 2015), (Dalkin et al., 2015).

Although I understood both mechanism and context concepts from a theoretical perspective, extracting and accurately coding data as a mechanism or a context was far from straightforward in the initial stages. After practice and experience I could see those changing relationships over time as well as at different levels (individual, team, business, work culture), meant that causation was not static and that coding needed to account for that. I learned that a mechanism at one time point could be a context at another and this made the coding practice clearer.

In relation to each of these challenges I realised that it was about my intellectual confidence to defend my approach based on some core principles and seeking reassurance from some researchers who had applied the method in other fields. The use of the RAMESES network hosted on JISCMAIL was a source of reassuring support. I am giving attention to these issues at this point in the thesis as the methods I used were being applied against this background of getting to grips with these core operating principles.

RAMESES II Standard 2 (Understanding and applying a realist principle of generative causation) requires the researcher to "demonstrate exemplary understanding of the principle of generative causation and application of methods consistent with that understanding". I believe that I have demonstrated this and the research approach that follows also provides evidence of this.

The design of this realist evaluation: theory gleaning, refining, and testing

There were three key stages in my study: Stage One *theory gleaning* when data was gathered and explored to understand and develop initial rough programme theories, Stage Two *theory refining* when a realist review helped clarify and refine the initial theories and Stage Three *theory testing* when case studies were used to test and further refine the theories (Manzano, 2016). Between each stage, there were discussions with staff from the Step Count Challenge (Research Advisory Team) to sense check interim conclusions, assist with focus and prioritisation decisions and to comment on design of the next steps.

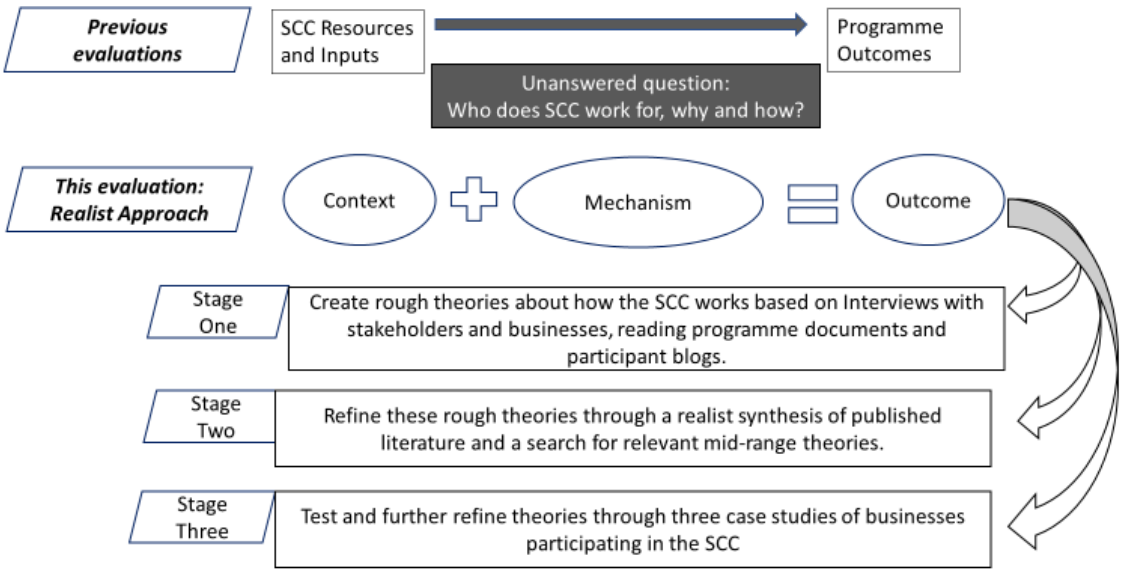


Figure 3: Overall structure of the study

Figure 3 is a visual representation of the entire process for this thesis. It shows the three key stages of theory gleaning, refinement, and testing and how these were used in the process of continuous refinement of the programme theory (C+M=O). It also shows the gaps in knowledge that this process sought to address. I will return to this visual at the start of each of my three data chapters as a visual reminder of their place in the overall process.

RAMESES II Standard 4 (The evaluation design) requires a clear justification for the realist evaluation, including a logical flow through developing and testing programme theory/ies. I believe that I have demonstrated this. Standard 4 also includes a criterion that ethical clearance is obtained if required and this is addressed below.

Ethical clearance

This study involved primary data gathering from human participants and as such it was important to consider the ethical implications of this work. The ethical standards that were applied to all primary data that were gathered during the study included adherence to the principles and ethical standards of the British Psychological Society (The British Psychological Society, 2014) and the local regulations of the Moray House School of Education Ethics Committee.

Given the iterative and emergent nature of the realist approach, it was not possible to undertake one overall application for ethical approval. For that reason, applications to the ethics committee of the School were submitted and approved on two separate occasions.

- Applied on 19th April 2018 and approved on 3rd June 2018 - Stage One: application for primary data gathering associated with the generation of the programme theory. (Appendix 1)
- Applied on 7th August 2019 and approved on 29th August 2019 – Stage Three: application for data gathering associated with the case studies. (Appendix 2)

In conclusion, all data used in this thesis has been provided with the informed consent of the participants, under the approval of the Ethics Committee and to the standards of the BPS.

Stage One - theory gleaning to identify and develop a programme theory

The aim of Stage One was to generate a programme theory for the Step Count Challenge. Programme theory is a theory about how the intervention works (See Chapter Three for more detailed account of programme theory in evaluation). Some interventions have detailed programme theories developed a priori to guide their initial design. The Step Count Challenge did not have this and so it had to be developed.

The main questions used to develop this theory were:

- Why does the Step Count Challenge exist? (to elicit outcomes)
- What needs to happen for outcomes to be delivered? (to elicit processes)
- What are the key activities of the Step Count Challenge? (to elicit inputs)
- How a) plausible and b) feasible is the approach used by the Step Count Challenge? (to elicit barriers and challenges)

I used five methods to answer these questions and generate the initial theories – three to gather data and two to analyse the data:

Data gathering

- Content review and analysis of programme documentation
- A workshop with Step Count Challenge and other Paths for All staff
- Qualitative interviews with workplace champions

Data analysis

- Coding and content analysis of all data
- Configuring traditional theories of change and initial realist programme theories

As the Step Count Challenge has several different components and they interact in complex ways, it was to be expected that there would be many theories relating to how the Step Count Challenge works. In the development of programme theory/ies it is acceptable to define parts of the programme that are of greatest interest (to the researchers and to stakeholders). There is no requirement to theorise an entire intervention and experienced realist researchers caution against this (Westhorpe, 2014), (Punton et al., 2016).

In collaboration with the Research Supervision Team and the Research Advisory Team we agreed to focus on seven programme theories that emerged most clearly. In the Research Advisory Team, we explored whether we could prioritise or focus these theories further and it was agreed that, as they were all of interest to the staff in Step Count Challenge, I would pursue all seven theories in Stage Two.

RAMESES II Standard 3 (Constructing and refining a realist programme theory or theories) requires that an initial tentative programme theory/ies is identified and developed and that this is then re-cast and refined as a realist programme theory. The initial theory gleaning stage was designed in line with this standard and delivered both an initial theory and a realist programme theory.

Stage Two - theory refining by undertaking a realist review

Having gleaned and configured seven initial programme theories in Stage One, the main aim of the next stage was to refine each of these seven theories by delving deeper into material that could offer further explanations and clarity. I choose to do this by undertaking a realist review (also known as a realist synthesis).

The main questions that I was seeking to answer through the review were:

- What more can I learn about the populations to which each of the theories apply (a realist question of 'for whom')?
- What more can I learn about how the mechanisms work (and the realist question of 'in what context')?
- Where I had identified candidate mid-range theories for each of the seven programme theories, what more can I learn about how these theories may be operating in these programmes? (The realist question of 'how and why')?

The review was not confined strictly to these questions and data that seemed relevant to help me to understand the seven theories that had been identified was also pursued.

Realist reviews, whilst sharing many of the tools and principles of other types of systematic review have areas of distinct difference.

Iterative, inductive, investigative

A realist approach reviews data to elicit, refine and test mechanisms within specific contexts. Within a multitude of real or perceived contexts that could include personal, organisational, social, and environmental, reviewers seek to find and understand the responses and reactions to different aspects of interventions. As Gough, Oliver, and Thomas (2017) have stated "Rather than identifying replications of the same intervention, the [realist] researcher should adopt an investigative stance and identify different contexts within which the same underlying mechanism is operating" (p. 54).

A realist approach takes an 'investigative stance'. That is, it pursues lines of inquiry in a dynamic way, drawing on and revisiting various sources of evidence. It requires a strongly inductive and iterative approach within the review. This way of working is unlike the deductive and often 'a priori' frameworks and criteria of more traditional 'what works' reviews, such as those conducted within the Cochrane Collaboration. However, unlike for example grounded theory (Glaser & Strauss, 1965) this realist review started with a set of indicative programme theories to be refined and later tested.

In the RAMESES II Standards (Wong et al., 2013) it is acknowledged that in the process of testing theory, the theory may need to be further refined, then further tested (p. 31). As such the realist review process can be iteratively generating, refining, and testing theory/ies. In my study the review was used mainly to refine the initial theories for later testing.

Rigour and quality assessment

In the same way that a meta-narrative review, a critical interpretive synthesis, or a Cochrane review are each 'systematic reviews', so too is a realist review. According to Gough et al. (2017) a systematic review is "a review of existing research, using explicit, accountable rigorous methods" (p. 5). By using the RAMESES I and II Standards, my approach was systematic in that it was explicit and accountable about its rigour.

Unlike most systematic reviews though, the rigour in realist reviews is determined across the whole of the review approach, and is not applied only at the level of individual studies drawn on in the review. Ray Pawson (2006a) points out that the form of the review needs to fit its function (p.133). He explains that if the purpose of the review is to aggregate the net value of primary studies, then primary studies need to be fit for that purpose by meeting rigorous quality standards. In realist reviews the purpose is to provide 'an explanatory programme theory'. As such any sources which can help explain how a programme might work can be a valuable source of data.

Wong (2018) helpfully clarifies this further by explaining that it is the 'trustworthiness' of the data, the 'coherence' of the argument, and the 'plausibility' of the theory that is to be assured (p137) rather than the individual items of evidence that have been synthesised to inform that theory. Wong (2018) likens the realist review to a legal case where each item of evidence may be of variable trustworthiness but, overall, they add up to a coherent and plausible case (p.143). It is therefore in the overall coherence and trustworthiness that the study demonstrates its rigour.

Realist reviews can be undertaken as stand-alone pieces of research to refine and test programme theories and as such they have a set of specific standards called RAMESES I Standards. As this realist review was integrated into a broader realist evaluation, I applied three of the eight RAMESES I Standards in this stage of my study. The other five overlapped with the RAMESES II Standards for the overall evaluation. The three standards that I applied included Standard 5 (Developing a search strategy), Standard 6 (Selection and appraisal of documents) and Standard 7 (Data extraction). Detailed evidence in support of meeting each of these four standards is provided in Chapter Six.

Stage Three - theory testing through case studies of workplaces

The aim of Stage Three was to test, refine and improve the programme theories using the insights and experiences of workplaces participating in the programme. Based on the refinements that took place in Stage Two, the number of theories had been reduced and consolidated into 5 over-arching programme theories, with 17 detailed programme theories within these. The core question was to test the relevance and significance of the over-arching theories and then based on this, to explore, in more depth, the detailed programme theories (for the relevant and significant over-arching theories).

Based on discussions with the Research Supervision Team and the Research Advisory Team, it was agreed that there would be four case studies of workplaces who have participated in the programme and that the first one of the four would be a pilot case study. The workplaces were selected to ensure factors of importance within the theories were included and this is detailed in Chapter six. Within each of the four case studies, the sample included:

- One senior manager with a remit for staff health and well-being (a leadership role for staff health)
- One staff member responsible for promoting and coordinating the challenge (a workplace champion)
- Up to ten staff who have participated in the challenge

Each of the case studies also included contextual documentary analysis relating to the companies' participation in the challenge (for example their health and wellbeing policy, staff newsletters, all staff recruitment emails). The two individual interviews and one group workshop with participants were semi-structured and invited interviewees to share their experience of specific aspects of the challenge. The group workshop was facilitated by me, and participants were invited to reflect on, discuss and share their views on the theories.

This field work was conducted in December 2019 and January 2020. One of the four companies (a pharmaceutical company) dropped out of the research in January 2020. Given the emerging issues with COVID-19, it was agreed in the Research Supervision Team that the 'pilot' case study had worked well and therefore I completed three full case studies by using the pilot study as a full contribution to the research. Given the timing of the research and the pre-occupation of health and safety staff with COVID-19 it was agreed it would not be possible to recruit a further case study workplace. The final case studies included:

- A national social care service provider (national HQ with remote workers)
- An international manufacturing company (a 24hr shift pattern factory)
- A school within a University (a city centre unit within a large institution)

The purpose of interviews and workshops was to test specific theories (Manzano, 2016). The theories therefore were presented to the interviewees and workshop participants to get their reactions and insights. Working in this way was unusual and it was challenging not to be concerned about confirmation bias in the responses. However, following debate among RAMESES members in JISCMAIL (Westhorpe, 2019) it was clear that the rigour comes from the transparency of the interpretation and analysis (Wong et al., 2013) rather than the design of the questions.

I chose case studies as the most appropriate method to test the programme theories. I argue that this approach of focussed workplace cases would help test and refine theories about how the Step Count Challenge might work in these different environments. Easton (2010) notes that "a critical

realist case study approach is particularly well-suited to relatively clearly bounded, but complex, phenomena such as organisations, inter-organisational relationships or nets of connected organisations" (p123).

RAMESES II Standard 6 (sample recruitment strategy) is clear that the sample must be purposive and able to provide data about contexts, mechanism and outcomes. I met this requirement and further details of the sample can be found in chapter six.

Data Analysis

This overall study used retroductive reasoning as its main tool for analysis (Justin Jagosh, 2020). "Retroduction has been identified by Harrè and Bhaskar as overcoming the deficiencies of the logics of induction and deduction to offer causal explanation. Retroduction entails the idea of going back from, below or behind observed patterns or regularities to discover what produces them" (Lewis-Beck et al., 2004) (p.972). This approach provides the required ontological depth to be able to identify generative causation (Justin Jagosh, 2020) .

For me, this involved iterations of inductive data-driven and deductive theory-driven analysis to continuously develop, refine and test how and why the Step Count Challenge might work. Figure 4 provides a detailed illustration of the process and is taken from my analysis in Stage One.

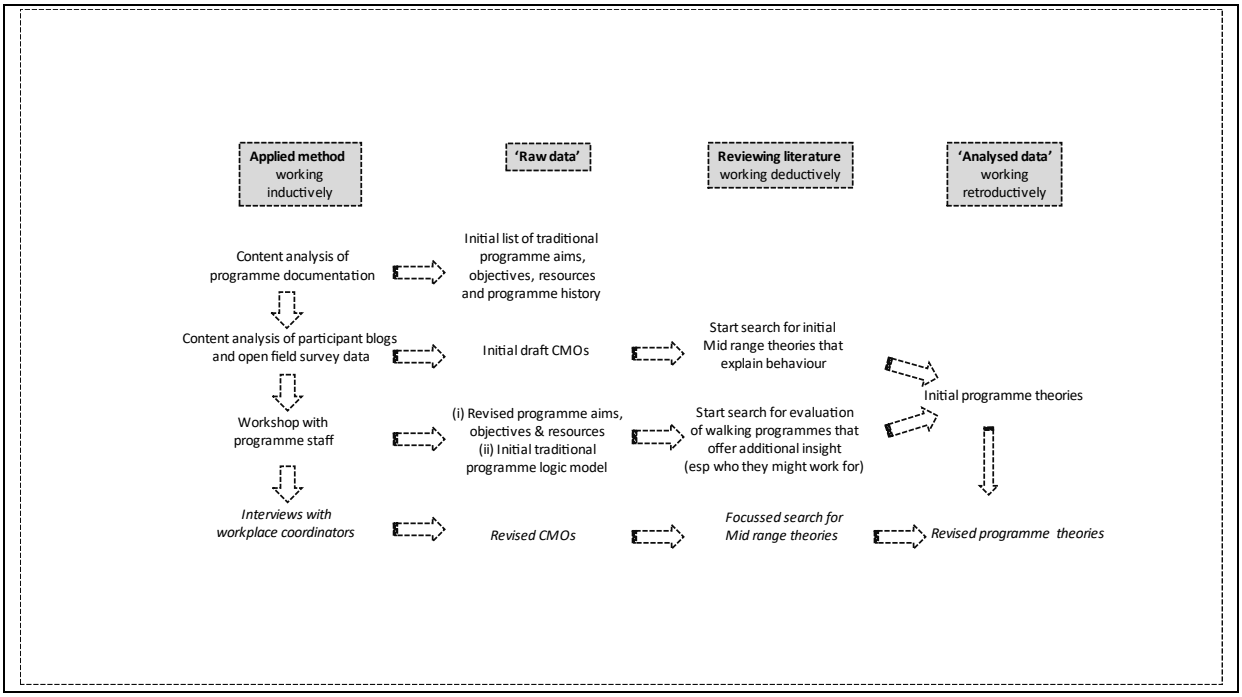


Figure 4: Stage One Inductive and deductive iterations

The evolution of these continuously refined theories was held and tracked in NVivo using an approach described by Forster, P, SM, M, and SM (2015). These data were added to NVivo in four main stages as set out in Table 1.

The Data Coding Framework in NVivo				
Theory 1 (repeated for each new/additional theory)	Preliminary Data	Stage One Theory gleaning Data	Stage Two Theory refining Data	Stage Three Theory testing Data
Context Mechanism Outcome	Data providing the origins of the theory from preliminary reading – the Initial Rough Programme Theory. Some CMO structure but many gaps	Data from interviews with stakeholders and participants – coded to develop, delete and refine CMO configurations Initial search for possible mid-range explanations	Data from realist synthesis - coded to test and refine the theorised CMOs from phase one	Data from Interviews and group discussions to test and refine specific theorised CMOs from phase two
Additional data and notes	Data and narrative notes about how I thought this theory might be working.			

Table 1: Coding framework in NVivo

The NVivo field for additional data and notes was an important aspect of tracking 'hunches' I had about the theories and for maintaining a transparent investigative stance.

RAMESES II Standard 7 (Data analysis) notes that data analysis in realist research is not a method but way of interrogating data using a retroductive approach. The way in which this is applied should be transparent. I have adopted this general approach and chapters five, six and seven provide additional details of how these data were interrogated and analysed. I believe this meets this standard.

Data management

All interviews, workshops and focussed group discussions were recorded and the original sound files are held securely in the University of Edinburgh data store. Relevant data were then extracted and transcribed directly into NVivo and were anonymised.

Hard copies of documents (Paths for All programme information, company reports and, signed ethics forms) were stored in locked filing in the University of Edinburgh. Electronic copies of documents were catalogued in MS Excel and filed in the University of Edinburgh data store. Relevant data were extracted and inserted directly to NVivo for analysis.

Summary

In this chapter I have argued that doing a realist evaluation is more about applying a particular thought process than it is about learning and applying a set of methods. The concept of retroduction and generative causation are central to this process, and they require iterative rather

than linear working. In this chapter I also explained the focus of the study overall, the questions addressed, and the approach adopted in each of the three stages. I also outlined the seven RAMESES II Standards for the conduct of realist evaluation and set out how I believe that I have met these standards. Finally, in this chapter I reported on ethical approval and data management.

Within this chapter and in each of the following three chapters, I have provided more detail on the methods I used in this PhD than is perhaps usually provided in a thesis. I have done this for several reasons: (i) the realist method is not well documented in the literature (ii) the research approach is less well-known in the physical activity research area (iii) I wanted to demonstrate how I have met the RAMESES standards.

The following three Chapters each set out the aims, specific methods, findings, and conclusions for each of the three stages of the PhD. I return to Figure 1 at the start of each Chapter as a reminder that although each stage had a specific focus, it did not stand alone.

Chapter Five: Developing a programme theory

Introduction

This chapter provides a full account of process of developing the initial realist programme theory (in some of the published realist literature this is referred to commonly as an IRPT, but I will use the term in full throughout this chapter). I include the aims, methods, findings and conclusions for stage one in this chapter.

Figure 5 Illustrates the place of Stage One in the overall thesis, as indicated by the blue shading.

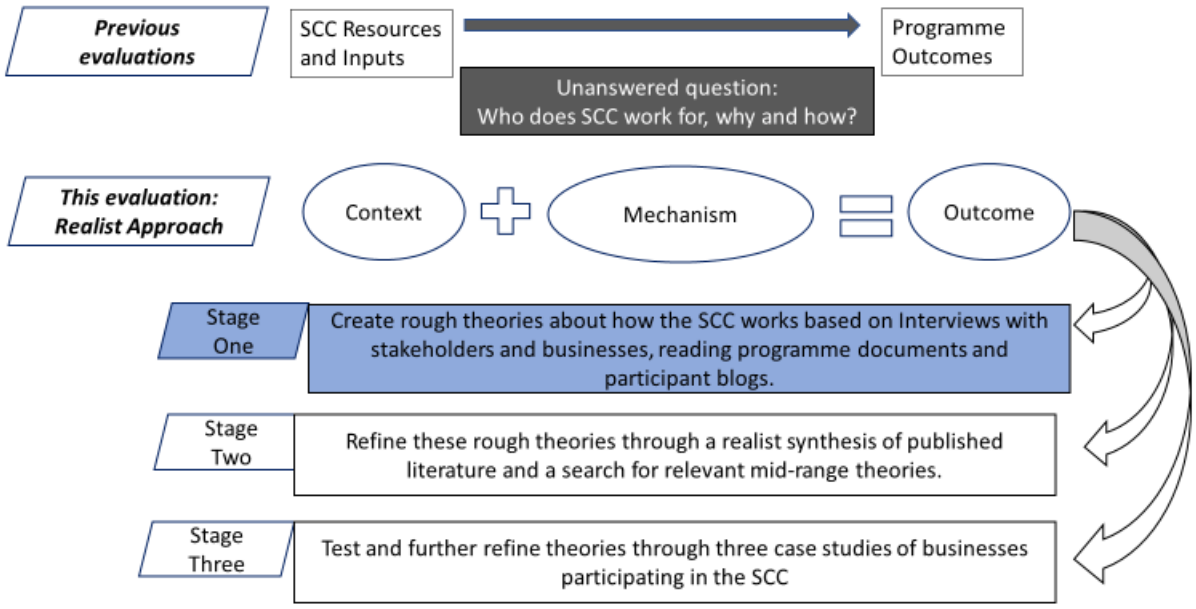


Figure 5: Overall structure of the study showing the place of Stage One

Aims and objectives

The specific aim of this theory gleaning Stage One was to generate a programme theory for how a walking intervention, such as the Step Count Challenge, might work.

The main objectives were:

I. To create an initial basic programme theory.

II. To develop this initial basic programme theory into a realist programme theory.

A further objective for the stage was to illustrate the method in enough detail to allow others to consider using the approach for physical activity programmes.

Method

There were three key methods used to collect data and two methods to analyse data to develop the initial realist programme theory:

Data collection included the following activities, and each is detailed further below:

1. Review and analysis of the Step Count Challenge programme documentation provided by Paths for All who designed and offer the intervention (hard copy and digital files and on-line information).
2. A workshop with key Step Count Challenge staff (n=5) to elicit their original programme design assumptions as well as aspects of the programme that may not have been documented.
3. Qualitative interviews (n=3) with local workplace coordinators

Data analysis

1. Coding and retroductive content analysis (Justin Jagosh, 2020)
2. Configuring programme theories

The method used in each of these steps is detailed below. It is important to note that although presented as five steps, the realist thought process was in practice more iterative.

Collation and analysis of programme documentation

There was a significant volume of documentation about the development and design of the programme from 2011 to present. These data were reviewed to familiarise the researchers with the programme and its history, as well as to start the generation of programme theory. The programme documentation that was reviewed typically included the following for each year of the challenge:

- Project planning and timetables
- Marketing material
- Media coverage
- Prizes and competitions
- Blogs from staff and participants
- Sign up numbers
- End of challenge evaluation results (survey monkey data)

There were approximately 3,500 items of programme documentation. A by-product of the research was an electronic archive of the Step Count Challenge documentation. The format and availability of these programme documents is summarised in Table 2.

	2010	2011	2012	2013	2014	2015	2016	2017
Hard Copy File	*	*	*	*				
Digital File		*	*	*	*	*	*	*
Website Content					*	*	*	*

Table 2: Programme documentation: format and availability, by year

There were four phases of review and analysis of the programme documentation and analysed was done in an inductive way in early phases and a deductive way in later phases to generate and apply

codes for components of the programme theory. Data were extracted from documents to Excel spreadsheets and a detailed inventory of the documentation was created.

The four phases of review and analysis of the programme documentation were guided by the RAMESES II programme theory questions (https://www.ramesesproject.org/media/RAMESES_II_Theory_in_realist_evaluation.pdf) In the **first phase** evidence of a formal programme theory having been used to design the programme either when it was first launched in 2011 or subsequently was looked for. In the s**econd phase I** undertook a content analysis to extract and code traditionally expressed programme aims, objectives, outcomes, inputs. This second phase sought to answer the questions 'what change does this programme intend to make' and 'what resources does this programme provide and for whom'. In the **third phase** I extracted and coded 'realist' content such as acknowledgement of different contextual factors or mechanism of change. This third phase addressed the question of 'how do people respond to the Step Count Challenge and in what context is this response being generated'. In the **fourth phase I** extracted and coded participant content from surveys and blogs and reviewed for participant responses to the programme. Primarily this phase of the analysis addressed questions about 'what outcomes are being generated by the Step Count Challenge'.

Participant-reported outcomes were also treated as programme outcomes. By this I meant that, as bloggers and blogs were selected by Step Count Challenge staff, it seemed reasonable to conclude that staff would select blogs that represent the intervention as they understood it to operate and as they wish to have it portrayed to potential future participants. For each of the identified outcomes, deeper searching of the programme documentation was done to seek out and understand possible 'generative mechanisms' and contexts that were linked to these outcomes.

When recurring patterns and relationships could be constructed from the data, data were exported then to NVivo. This latter step started the generation of initial CMO configurations (realist programme theories). At this point, the data were combined with the data from the workshops and interviews (described below) and were analysed in a more iterative way within NVivo.

A workshop with Step Count Challenge programme staff

Ethical approval was granted from the University of Edinburgh (Ref: 1227, 3/5/18) for a workshop with Step Count Challenge programme staff. The aim of the workshop was to create a mental map of how Step Count Challenge staff see the intervention working in practice. Although much of the 'official' position on this is contained in the programme documentation, the workshop provided staff with an opportunity to describe how their programme works. As models are a common way of visualising and mapping programme theory (Rogers, 2008), it was decided that a workshop to generate such a model would be relevant.

The workshop included five Step Count Challenge staff representing a range of functions and levels in the organisation. A facilitation process (Appendix 3) was designed and delivered to address four key questions:

1. Why does the programme exist? (to elicit outcomes)
2. What needs to happen for outcomes to be delivered? (to elicit processes)
3. What are the key activities of the programme? (to elicit inputs)
4. How a) plausible and b) feasible is the mental map? (to elicit barriers and challenges).

Staff were invited to think retrospectively about why they did what they did and about how they think the Step Count Challenge currently works. I also encouraged staff to think prospectively and consider ways in which the Step Count Challenge could work more effectively or differently, were constraints and challenges removed. The aim was to use their expertise and awareness to theorise all the possible ways in which the Step Count Challenge might work. Manzano suggests that realist interviews are often iterative and can 'glean, refine and consolidate' (Manzano, 2016). In this workshop we were very much at the stage of theory gleaning.

Qualitative interviews with workplace coordinators

Following ethical approval granted from The University of Edinburgh, interviews were undertaken with staff who coordinated workplace teams. These were included to ensure that perspectives at the level of individual workplaces informed the programme theory.

I interviewed three workplace coordinators who had significant experience of the Step Count Challenge and could engage confidently with the questions. The following criteria were used to select the workplace coordinators: coordinated more than one workplace team (i.e. a role that is more than a team leader of a single team) and coordinated at least three or more challenges in their workplace.

Given the extent of data that had been generated from the programme documentation and the workshop, and the iterative nature of realist programme theory generation, these interviews were designed to be both deductive (sense-checking the evolving programme theories) and inductive (adding new themes to the overall programme theory). Therefore, the interviews were semi-structured and guided by Manzano's advice (2016) on conducting realist interviews and aimed at theory refining as well as gleaning.

The interview schedule (Appendix 4) and approach were first piloted with a convenient sample of colleagues in the University of Edinburgh who had participated as coordinators in the Step Count Challenge. The interviews were voice recorded, imported into NVivo and relevant extracts were transcribed and anonymised.

Coding and content analysis from all three data sources

Marchal et al. (2018) comment that "when eliciting the initial programme theory, it makes sense to combine data collection approaches in an iterative process" (p.86). The use of NVivo to import, code and produce reports from which I could analyse the data from all sources allowed me to do this. It also allowed me to be more transparent about how I had coded and structured the data. I followed the process used by Forster and Dalkin (2015) in their realist evaluation . The process was as follows:

I. I created nodes for programme theory ideas as soon as I began to feel that they were emerging as repeating patterns in the data.

II. Within each programme theory node (the parent node) I created sub-nodes for data sources (content analysis, workshop, interviews, and literature about substantive theories). These were the child nodes.

III. I then returned to the original data files to code and import them into relevant child nodes in NVivo.

IV. When all data were coded and imported, I selected the 'aggregate coding from child nodes' function which meant that the parent node (for each rough programme theory concept)

now stored information from the child nodes, giving the option to aggregate and review all data for each programme theory.

Configuring programme theories

Data coded from the programme documentation and workshop were brought together to construct an initial 'rough' traditional theory of change. I have presented this in the findings section as 'initial findings'.

To develop this initial theory into a realist programme theory, I coded more information from documentation about possible mechanisms and contexts in the third phase described above. The fourth phase analysed programme documentation with a focus on participants' content and provided rich data about programme contexts and possible mechanisms (i.e., how participants responded and reacted to the programme) as well as outcomes, described from the perspective of participants.

These data offered enough information to be able to begin the process of configuring realist programme theories. I knew that it would be possible to detect and map a very large number of possible CMO configurations. To address this challenge, I discussed the issue with the Research Supervision Team and Research Advisory Team. We agreed that I would focus on the frequently occurring patterns where it was clear there was both a depth and breadth of data from a range of sources. Such patterns are known as 'demi-regularities' in realist evaluation approaches (Ray Pawson, 2006b) (Rycroft-Malone et al., 2012). In doing so, I was aware that that I was not configuring a comprehensive and all-encompassing programme theory and that this is entirely consistent with realist research (Westhorpe, 2014) (Punton, 2016).

I initially identified seven patterns that emerged with a reasonable level of plausibility based on knowledge of the area and the strength of the data gathered. In the Research Supervision Team we discussed mid-range/substantive theories (as described on page 23) that I believed had some resonance with the recurring patterns and that may offer some further insight and explanation into the core concepts described in the pattern. Marchal et al. (2018) explain the value of this theorising: "middle range theories enable the researcher to move from single-loop learning to double-loop learning: by comparing the findings and explanations found in different cases through the lens of the initial theory, the specific context of each case can be transcended" (p.84).

These theories offer a perspective from a different level of abstraction and can act as a scaffold to support the translation and re-casting of ideas from the specific intervention (in this case the Step Count Challenge) to a more generalisable programme theory that could operate in similar interventions (Shearn et al., 2017). These mid-range theories were not used in a definitive way, rather they were used to assist with refining the emergent realist theories and allowing us to reflect on the theory at a greater level of abstraction (Shearn et al., 2017).

I found that using the core constructs of established mid-range theories, woven through the more partial and emergent programme theories allowed me to draft longer explanatory narratives about the programme theory. I found these longer narratives helped me to be transparent about the search for ontological depth as they told the emergent, multi-dimensional story, from which a more precise realist theory could be teased out.

Findings

There were two stages of findings – the initial traditional theory of change and then the development towards realist programme theory configurations (CMOs).

Initial Findings

Data from the programme documentation and workshop were brought together to address objective one and enable the construction of an initial 'rough' traditional theory of change.

Programme aims

Based on these data, the following were identified as the 'programme aims': To,

- improve the mental, physical, and social health of participants,
- increase awareness of the benefits of physical activity,
- increase physical activity through walking,
- and reduce sedentary behaviour.

Programme inputs

The programme documentation and workshop identified information about the nature of the contribution being made by Paths for All. This was defined as the programme 'inputs'. These were:

- training and 1-1 support for workplace coordinators,
- communication through multiple channels (web, email, social media), (the content includes FAQs, core health information about physical activity, blogs to encourage and inspire, leader-board and personal goalsetting and rewarding) and
- a range of competitions and prizes for teams, leaders, and worksite champions (individuals who had in the opinion of their colleagues really 'championed' the activity).

Programme mechanisms

Although there was an attempt in some of the programme documentation to explain how the inputs generated the intended aims, there was limited clarity about how change was generated within the programme. However, based on the workshop findings, the following four areas were the type of things that could influence the likelihood of aims being achieved (or not):

- workplace culture (in particular, workplace leadership),
- practical facilities and arrangements in the workplace (for example, specific worksite locations and roles),
- individual access (this was focussed largely on technology barriers), and
- team dynamics.

Based on this information an initial basic programme theory was constructed. This was not designed to provide a comprehensive analysis of how the programme worked. It was a starting point from which I could see the mental map of those who had designed and influenced the programme.

Findings that led to realist configurations of programme theories

As described above, I focussed on seven repeating patterns in the data. These are summarised in Table 3 below:

Number	**Descriptor**	**Link to mid-range theory**
Theory 1	Encouragement to get up and walk around	Social cognitive theory

Theory 2	A desire to get back to better health	Health belief model
Theory 3	Blowing away the cobwebs	Attention restoration theory
Theory 4	Team-work and support of colleagues	Social support
Theory 5	Competition	Achievement motivation
Theory 6	Peer pressure	Self-efficacy
Theory 7	Structured actions	Trans-theoretical model

Table 3: Initial seven realist programme theories

As I worked iteratively through these patterns, it became clear that there were areas of overlap between some of the theories and so I made decisions to join data and to subsume some theory patterns into other theories. As this was done iteratively, moving forward and backward between data gathering stages and steps, there were also some decisions made following the initial stage of the review (see Chapter Five), based on an initial scan of the review data. This caused me to revisit the programme theory stage and revise some of my theories.

I have chosen to be as transparent I can about the 'messy' nature of realist theorising as this is a required aspect of meeting the RAMESES II Standards (specifically Standard 3: programme theory is re-cast and refined and Standard 7: data analysis is iterative over the entire course of the evaluation). I am presenting these decisions regarding the revision of theories in this chapter and in chapter five to reflect clearly how and when the decisions were made. The decision to drop Theory 7 was also undertaken in collaboration with the Research Advisory Team, who felt there was limited new insights to be gained from pursuing this further.

Number	**Descriptor**	**Link to mid-range theory**	**Revision made**
Theory 1	Encouragement to get up and walk around	Social cognitive theory	No change
Theory 2	A desire to get back to better health	Health belief model	No change
Theory 3	Blowing away the cobwebs	Attention restoration theory	No change
Theory 4	Teamwork and support of colleagues	Social support	No change
Theory 5	Competition	Achievement motivation	Combine 5 and 6 and consider self-determination theory as explanatory to both
Theory 6	Peer pressure	Self-efficacy	See above

~~Theory 7~~	~~Structured actions~~	~~Trans-theoretical model~~	Decision taken to drop this theory from the analysis.

Table 4: Revised realist programme theories

Below, I have chosen to present one of the six patterns in detail (Theory Three) and a summary of the remaining five theories. By illustrating one theory I hope to show clearly how following the realist thought process and asking 'why/how' gets deeper into possible realist explanations for how the programme works. I also thought that by providing one detailed example, the reader would understand the realist method and logic that applied to the others without the need for lengthy explanation in each case.

I chose to illustrate Theory Three in more detail, as this used a mid-range theory that would perhaps be less familiar to researchers working in physical activity.

Theory 3- Blowing away the cobwebs

The official documentation for the Step Count Challenge mentions that the "*A physically active workforce has been shown to be more productive"*. In the workshop with Step Count Challenge staff, it was also concluded that improving mental health through the reduction of sedentary behaviour and through an increase in physical activity were fundamental goals for the Step Count Challenge.

My interest was in exploring further how and why being more physically active (and specifically more active through the Step Count Challenge programme) would generate increased productivity and improve mental health – and whether these outcomes were related or independent.

I turned to the participants' data in the blogs to look for answers to this question. I found that many participants mentioned the value of the Step Count Challenge being the chance to 'get a breath of fresh air', 'to blow away the cobwebs', 'to clear my head' and 'to get away from my desk and get outdoors'. It therefore seemed that there was a plausible connection between the mental health and wellbeing outcomes (and possibly the productivity outcomes because of improved mental health states). However, I needed to dig deeper into these data to explore how and why being outdoors through the Step Count Challenge would link to mental health and productivity.

One participant, in their blog, described "*the feeling of wellness after a nice walk in the fresh air. Guaranteed to make me feel good, whether it is a relaxing short walk or a big hike up a mountain. If I am having a stressful day, I find even just a short walk in the park is enough to improve my energy levels and mood for the rest of the day"* (Blogger S). Another blogger observed "*Although some walks felt like a plod, the fresh air and lack of being glued to a screen did provide plenty of time to think and allowed creative juices to flow"* (Blogger I). Another blog expressed something similar but linked to stress reduction, *"I tend to find if my head is feeling full or I am at all stressed out I will always feel better if I take some time out and go for a walk just to clear the thoughts I have going on and get a bit of fresh air"* (Blogger C).

I then returned to the blogs to see if I could understand more about why and how this outdoor experience, through the opportunity of the Step Count Challenge, might generate improved mental wellbeing. In doing so I found references to experiences of being 'startled by', 'struck by' 'moved by' heightened sensory stimulation and awareness such as smells, noise, colours and textures. Participant comments in blogs such as, "*meeting wildlife increases your wellbeing … it puts you in a*

better mood … it's good for body and soul" (Blogger Y). Another blogger commented that *"You walk in what looks like a barren landscape and then when you look closely you see it all"* (Blogger W).

Central to this repeating pattern were the components of being away from work, being in natural surroundings, being stimulated to engage with the surrounding and feeling better as a result. I then looked for established mid-range theories that might help explain why these things were connected. I found that Attention Restoration Theory (ART) (S. Kaplan, 1995) was a theory that could help me to explore how and why these participants might be having this experience as a result of participating in the Step Count Challenge.

ART states that people can restore their ability to concentrate by spending a short amount of time in nature. The restorative function works on the basis that we have two types of attention: voluntary and involuntary. In most jobs it is a requirement to direct our attention (and avoid distraction) to complete tasks – this is voluntary attention. After some time directing our attention, the ability to continue directing attention becomes depleted and fatigued. By switching to involuntary attention, which uses a different part of our brain, we can restore our capacity for voluntary attention again. Involuntary attention has been shown to be possible in nature under four conditions: firstly, 'being away' from the tasks that require our attention, secondly 'having fascination' that is effortlessly processed, thirdly having 'coherence' of being in a whole other world, and finally being 'compatible' with our preferences and needs.

By using the key constructs of Attention Restoration Theory (S. Kaplan, 1995) (presented in single quotes below) and weaving into and around data I had already gathered, I was able to generate the following explanatory narrative:

> Evidence suggests that work is increasingly mentally and cognitively draining, leading to risk of fatigue, stress and burnout if not prevented by proactive intervention. Work is also increasingly sedentary. These data refer to the Step Count Challenge being a way to "blow away the cobwebs" and escape the stressors of work. Participants express a clear desire to have an opportunity to 'be away' from their work and to use the Step Count Challenge as an opportunity that is 'compatible' with this need for a break. The way in which participants notice aspects of the environment such as trees and rivers as well as the seasonal nature of the outdoors suggest a 'fascination' element that engages them. The simplicity or 'coherence' of the natural environment seems to be an antidote to the nature of their work. As a consequence of escaping for a walk, in nature, employees feel refreshed and function better when they return to work.

From this narrative I then configured the following CMO to which I later added the I for Intervention, to make the mechanism clearer:

> In a context where people spend significant time indoors (C), the Step Count Challenge provides a reason to get outdoors (I) this enables us to restore our ability to think (M), thereby reducing stress (O) and increasing personal productivity (O).

Theory 1 - Encouragement to get up and walk around

One of the clear themes to emerge from the analysis of the blogs was a sense that participation in the programme provides sedentary employees with encouragement to get up and move around. In some cases that encouragement was expressed as a sense of having permission to move in workplace cultures where moving is not the norm. One of the workplace coordinators described the programme as a "*thing to hang your hat on"* and noted that *"There were even walking meetings and that"* (Coordinator C).

One of the participants described the nature of work and the role of the programme as "*We are all stuck behind computer screens all day long and often forget to get up and stretch our legs. This challenge is a great reminder to get moving throughout the day when we can*" (Blogger S). Another blogger similarly commented that, "*I love that it makes me, and my colleagues get up at work and go for a walk, makes me more aware of my steps and encourages me to go on longer walks on the days I'm stuck at my desk for a long period of time"* (Blogger G)

I thought that the Social Cognitive Theory (SCT) (Bandura, 2004) could help offer explanatory insights into how this mechanism might work. At the heart of SCT is the concept of reciprocal determinism: that personal, environmental, and behavioural factors are inter-related and that by altering one, all three can be changed. SCT includes social learning theory (Bandura, 1977) which suggests our behaviour is shaped by observing others, copying others and being motivated to gain/avoid the outcomes that others' behaviour leads to, primarily in terms of rewards and punishments. SCT adds to this by emphasising the cognitive aspect of this process: that we observe the behaviours of others in social contexts, and we have thoughts and feelings about this that lead us to behave in certain ways ourselves. SCT uses core constructs of self-efficacy, self-regulation, self-directedness, and self-reflection to help explain how this process works.

Using the data from participants and viewing through the lens of Social Cognitive Theory I was able to create a story about this theory of encouragement and permission to walk at work might work:

> Workplace culture signals that sedentary behaviour is the norm. When people are at work, their locus of control can feel external. This results in passive sitting behaviour despite people having the capability to move more and the knowledge that this would be beneficial. When people do not move the lack of physical activity combined with work can induce fatigue, enduring fatigue can cause stress. This can spill over into non-work time. People's expectations are that this is just how work is.
>
> When businesses sign up to the Step Count Challenge this signals a change in culture. People perceive that participation may be rewarded. They respond to step counting as a way of self-regulating and their expectations change. They expect to be able to have a break and to feel better (and to value feeling better). The locus of control shifts to being more internal. The overall sense is of moving from passive acceptance of being stuck to active choice. The self-regulating aspect builds capability and is reinforced through the team.

Having this story about the theory, I was then able to create a draft realist programme theory:

> "In a context of sitting for long periods of time at work (C), the Step Count Challenge encourages and offers a sense of permission (M) to take an active break from work, resulting in feeling refreshed and mentally restored (O)".

Theory 2 - A desire to get back to better health

A further theme to emerge from the participant data was that there are employees who see the Step Count Challenge as a way to support them to address a known health issue. As one employee noted: "*This has coincided with joining Slimming World and together both activities have changed my daily life and have encouraged me to keep going. I have half a stone off already too*" (Blogger B). Using the programme to lose weight was a commonly mentioned theme. Others noted specific health issues such as one participant who stated that *"Since giving my kidney last year I found it harder than I thought to pick up old routines, it isn't that I am not fit enough; it was other things filling my time. Having picked up the gauntlet of the challenge moving is once again taking up its place in my day"* (Blogger R).

Given these employees had already recognised a health issue I thought that the Health Belief Model (HBM) developed by Hochbaum (1958) and Rosenstock (1974) could offer an explanatory framework for further analysis.

The HBM was developed in the 1950s to explain people's behaviour in response to tuberculosis screening programmes. Originally there were three core aspects to the theory: people's psychological readiness, situational influences, and environmental conditions. Awareness and beliefs about risks and benefits were important determinants of psychological readiness. Situational influences included whether they were experiencing symptoms, as well as other people's beliefs about the pros and cons of screening. The environmental conditions were thought to be about having the opportunity to be screened and how convenient that opportunity was.

Taken together the original constructs of the HBM were the perceived seriousness and susceptibility to disease and the perceived barriers and benefits of responding. Since the 1960s the model has evolved and three more core constructs have been added to help give further explanation to this model: modifying variables (Rosenstock, 1974) cues to action and self-efficacy. Taken together the model now includes six constructs.

Again, using the data that I had gathered and considering the constructs of the HBM I was able to generate the following theory:

> There are employees who know they have developed health issues (perceived seriousness) and that they would benefit from physical activity. For other employees they are aware of a decline in positive behaviours (perceived susceptibility) and wish to change. Taken together there are employees who are aware of threats to their health. For some, these threats can be a cue to action.
>
> The Step Count Challenge offers a convenient way of addressing barriers and experiencing benefits. The 'small steps' approach builds self-efficacy and creates further cues to action.

I then proposed the following realist programme theory:

> In a context where someone is aware of the need to improve an aspect of their health (C), the opportunity of the Step Count Challenge can align with that need and be a supportive structure to start building confidence (M) that they can return to a better state of health (O).

Theory 4 - Team-work and social support of colleagues

Another theme that was easy to identify from the data, given how frequently it was mentioned, was the social support and teamwork with colleagues. This theme was both about spending time with colleagues that were not known to each other and about the nature of walking offering people an opportunity to walk and talk together, away from work. It also included the social support that people could take from participation.

One participant noted that the programme "*has been a great way of getting to know my new work colleagues – I signed up for the challenge before I had started in my new job, so it helped to establish relationships within the team and get to know people a bit more quickly"* (Blogger N). Another describes how "*The team building aspect of having a reason to natter as you wander around. I don't get that opportunity very often. Normally I am here for a specific reason, to have a specific meeting with someone ... home based workers don't get the same opportunities to bind with their colleagues"* (Coordinator C).

Identifying relevant substantive theories of teamwork that helped explain this aspect of the programme was challenging. As Salas, Sims, and Burke (2005) have noted, "The study of team work has been fragmented through the years, and the findings are generally unable to be used practically". This is also observed by Rousseau, Aubé, and Savoie (2006) who comment that, "The existing body of literature on teamwork behaviours is substantial and offers many different conceptualizations. However, there is a lack of consensus concerning the conceptual structure of teamwork behaviours" (p.540). For these reasons, my search was not for a specific theory of team work or social support, but rather to search using the broad term 'social support theory'. Lakey and Cohen (2000) explore three perspectives on the nature of social support theory: (i) stress and coping, (ii) social constructionist and (iii) relationships. The latter two have resonance and explanatory potential for this theory.

In a social constructionist perspective, the self and the social are linked. How we think we are seen by others affects how we behave towards others. Looking at social support from this perspective suggests that it is the social interaction that generates the support outcome rather than the actual physical forms of support. The relationship's perspective is more about the nature of relations we have with others via constructs such as companionship and intimacy (positive) and conflict (negative) (Lakey & Cohen, 2000). In relation to the participant data, both perspectives have relevant explanatory potential and allowed me to create the following theory:

> Forming a 'new' team to participate in the Step Count Challenge helps people to get to know their colleagues and sometimes meet new colleagues. In this team-work theory people get frequent contact and support from each other to pursue the challenge together. They both give and get support, and this results in them personally feeling valued and included at work. The Step Count Challenge provides resources that can help create and strengthen this 'team-work' process: prizes and competitions generate rewards and celebrations in the team, blogs and Step Count Challenge champion nominations can help people to express and share what they find valuable about their team. Overall, the Step Count Challenge provides an enjoyable and fun way to build morale with colleagues leading to improved social health outcomes and greater enjoyment at work. Teams sometimes continue to walk together after the challenge because of the enjoyment they got from this teamwork.

From this theory I generated the following realist programme theory:

> In a context where people are often busy or work alone (C), the Step Count Challenge offers an opportunity to form a new team (I) which can lead to feeling more connected to and supportive of each other (M), whilst working together on the shared task of increasing their physical activity (O)

Theory 5 and Theory 6 - Competition and peer pressure

Two more theories (competition and peer pressure) were originally treated as separate theories. I later linked them and although treated as separate programme theories, due to the connection between being pressured into doing more in order to win, I felt it was valuable to present them together at this stage of the analysis.

'Competition' emerged as a theory as several participants talked positively about the value of the 'challenge' element of the programme and how it engaged their 'competitiveness'. The following is a description of one participant's experience in the programme, "*My greatest achievement to date is reaching 71,019 steps in one day. That took me nine hours but it was a glorious sunny Sunday. The Step Count Challenge really spurs me on and has seen my competitiveness go through the roof. I*

can't bear it when somebody achieves a better step count than me. My teammate Alain managed over 50,000 steps in one day in 2015 and I was determined to match or beat that… I succeeded!" (Blogger L).

Another participant describes how even injury would not hold him back: "*It was Week 2 of the Step Count Challenge and my knee was still troubling me. I had originally decided to take this 5K easy, but when I saw the group ahead, my competitive nature took over. I checked my heart rate and pace on my new Garmin Forerunner 235 (what a watch) and realised that I could, should and would catch them"* (Blogger S1)

'Peer pressure' emerged as the negative side of the challenge element of the study and was expressed in relation to how some people's competitive nature can create pressure for others to perform and keep up. One of the coordinators had noticed that "*I think there were some challenges. One team member was really unwell at the start of the challenge and instead of it being, I'll just do my best, it was like oh no I've got a really low number ... I think there was a lot of negative self-talk. They were frustrated. But that's more to do with our competitive nature than the Step Count Challenge"* (Coordinator C).

Another coordinator noticed something quite similar *"So, if people are not stepping then people tend to explain why they are not stepping ... why they haven't walked that day, whether it's for, well for different reasons. I think there's a little bit of, well people are going to judge, or people are going to wonder. I have noticed that"* (Coordinator A).

I thought initially these could be explained respectively with reference to 'achievement motivation' and 'self-efficacy' theories. On reflection, it was felt that although they may have different generative mechanisms and outcomes, a single theory may encompass further explanation for both. The candidate theory was Self Determination Theory (Ryan & Deci, 2000) (Deci & Ryan, 2008).

In brief, Self Determination Theory is a macro level theory with a focus on explaining motivation. The macro theory is guided by 6 mini theories. SDT explains that motivation can be mapped on a continuum with one end representing controlled (extrinsic) motivation and the other end representing autonomous (intrinsic motivation) – this is the Organismic Integration Theory. SDT explains that autonomous motivation is more likely to be present when our universal basic needs for autonomy, competence and relatedness are met – the Basic Needs Theory. Interventions using SDT therefore try to design ways to increase support and improve the context within which basic needs might be met. The overall outcome of this theory is that greater intrinsic motivation will lead to more sustained behaviour change. The Causality Orientations Theory and the Goal Content Theory help explain more about how individuals' basic needs can be satisfied or thwarted.

By reference to Self Determination Theory, and using the data for both theories, I was able to theorise how both might work:

> The Step Count Challenge attracts participants whose levels of physical activity vary. For some participants, walking, often extending to jogging and running, is an activity that feels relevant and significant and is one in which they feel they already excel. They can use the opportunity of the Step Count Challenge to do even more walking and to show others how competent they are at this activity. The self-regulating aspect of counting steps and having a stretching goals is also motivational. They also hope to be a beacon for others to show them how possible it is to be active every day. They are intrinsically/autonomously motivated and would enjoy being active with or without the Step Count Challenge.

> For other participants the Step Count Challenge is daunting. They are perhaps willing to give it a try, nudged on by others to join a team. They will rarely feel physically confident in the presence of others and may not even enjoy the experience of being physically active. They will fear letting the team down and may struggle on, even if they are not enjoying it. Their motivation is extrinsic and is founded on not letting others down, and not embarrassing themselves. However, for those that have a supportive team around them, they can come to enjoy the challenge more. As the challenge progresses, their confidence and enjoyment can grow. For others, without the support of a team, they may fail to complete the challenge and may even move to a more a-motivated state.

From this, I generated proposed realist programme theories for both:

Competition

> In a context where people enjoy an active life (C), the Step Count Challenge provides a competition in which people can test their ability (M) to do even more physical activity with each other and against each other (O).

Peer pressure

> In a context where people have been pressurised into joining a team and do not feel confident about physical challenges (C), the Step Count Challenge can make them feel vulnerable to being judged by others (M) resulting in them failing to complete or not enjoy the challenge (O)

Summary

In this chapter I described the methods used to generate the initial and realist programme theories. I described the data generated from Stage One and shared the deep and rich insights into aspects of how and why the Step Count Challenge produces a range of specific outcomes. These insights, combined with established mid-range theories, were then used to configure six initial realist theories. Having mapped these realist programme theories, they were then ready to be tested and refined in Stage Two which is a realist review/synthesis.

Chapter Six: Refining the theory through realist synthesis

Introduction

In Stage One (Chapter Five) I configured an initial realist programme theory for six theories in the form of Context/Mechanism/Outcome statements (CMOs). These were developed from a wide range of sources of primary data relating to the Step Count Challenge. Although not a comprehensive account of all the ways in which the Step Count Challenge might work, they nonetheless provided deep insights into a range of ways in which the Step Count Challenge programme produces some of its main health and work-related outcomes.

The purpose of Stage Two was to refine and improve these theories based largely on a synthesis of existing relevant literature Figure 6 provides an illustration of place of Stage Two (shaded in blue) in the overall thesis.

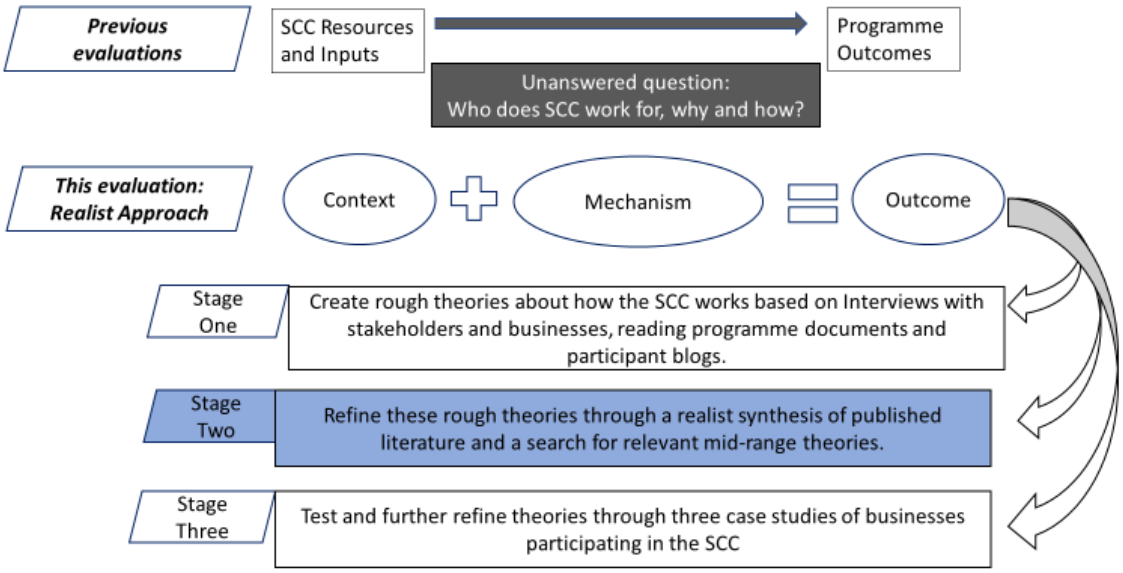


Figure 6: Overall structure of the thesis and the place of Stage Two

Aims and objectives

The aim of Stage Two was to further refine the key theories that might explain elements of how the Step Count Challenge produces some of its main health and work-related effects through a realist review of existing literature. The objectives were to:

I. provide a test of the draft theories and
II. to refine and improve the understanding of how the theories might operate.

As noted in Chapter Three, I applied three of the eight RAMESES I Standards for Realist Review in this second stage of my study. The other five standards overlapped with the RAMESES II Standards applied to the overall study and detailed in Chapter Three. The three standards that I applied from the RAMESES I Standards included Standard 5 (Developing a search strategy), Standard 6 (Selection and appraisal of documents) and Standard 7 (Data extraction). Each of these is specifically referenced in the relevant section below.

Method

Booth, Wright, and Briscoe (2018) identified six principal elements to a realist search (p. 153) which are presented as iterative and contrasted with the linear process of a conventional systematic review (p. 152). The six elements are:

1. Formulate lines of enquiry
2. Background search
3. Search for programme theories
4. Search for empirical evidence
5. Search to refine theories
6. Document the process

Elements one to three featured in Stage One of this PhD. Stage Two now addresses four and five whilst also refining and revisiting the others, as required. The remainder of this chapter focuses on the method used to search for evidence and the search to refine theories. In doing so, I am addressing item six.

To explain fully and clearly the iterative process of the search for included studies, preliminary findings are presented in the methods section to demonstrate how they informed subsequent steps.

Search for empirical evidence

Realist reviews, being iterative and conducted with an investigative mind set, are not started with an a priori set of categories that are then searched to be exhaustive. However, there still needs to be a starting point that has rigour and transparency. Although there is no blueprint for a specific realist approach to developing a search strategy, there are some core principles that are repeated throughout a range of articles. These are distilled below:

- There should be no restrictions or prioritising of study types (Wong et al., 2013)
- Diverse sources of evidence should be included (Ray Pawson, 2006b)
- Searching for similar mechanisms in other policy/programme areas is encouraged (R. Pawson, Greenhalgh, Harvey, & Walshe, 2005)
- Undertaking further searches within an overall search to refine and test new insights is expected (Booth et al., 2018)

However, even adopting core principles, there remains the significant challenge of adequately documenting and representing iterative searches, refinements and re-conceptualisations (Booth et al., 2018) (p. 163). Given this known challenge of conducting a realist review, I felt that it was important to explore whether there were existing strategies, tools and technologies that could be used to support the process.

A Starting Point: Cochrane Review of Workplace Pedometer Interventions for increasing physical activity (Freak-Poli, 2013)

Realist philosophy and method rejects the concept of a hierarchy of evidence (Ray Pawson, 2013). It is particularly critical of the logic that lies at the heart of most systematic reviews and controlled trials: that effectiveness can be judged based on repeated observations. It is perhaps then unusual

to choose a Cochrane Systematic Review as a starting point for this realist search process. However, this section proposes a justification for this approach, based on realist thinking.

There are three principle reasons why the Cochrane Review of Workplace Pedometer Interventions (Freak - Poli et al., 2013) provides a helpful starting point for this realist review:

- It is a comprehensive attempt to identify workplace pedometer intervention studies and its intent is to build an evidence base for programmes such as the Step Count Challenge.
- It has identified a significant body of relevant work, which can be investigated from a different philosophical position.
- The search strategy is transparent and can be adapted to increase its realist value, as well as being able to identify what is absent in the search strategy that would be relevant in realist work (for example, specific databases or types of studies).

A shared intent

Freak - Poli et al. (2013) found "insufficient evidence to assess whether workplace pedometer interventions are of benefit" (p. 3). However, working with Paths for All to undertake a small, non-controlled study of the Step Count Challenge, Niven (2015) found some indication of positive before and after effects. This latter study by Niven, in the context of Freak - Poli et al. (2013), was where the curiosity for this PhD was ignited. Revisiting Freak - Poli et al. (2013), through a realist lens, may provide access to many single studies that contain valuable insights into how programmes such as the Step Count Challenge might work. This PhD also shares the intent of Freak - Poli et al. (2013)- to improve the evidence for workplace pedometer interventions.

A significant body of work

Across the original 2011 search and the 2013 re-run search, Freak - Poli et al. (2013) identified 3,815 papers based on titles and abstracts, 175 of which were taken forward to full text screening (p. 10). This represents a significant volume of potentially insightful workplace pedometer intervention papers, if the explanatory interest of a realist study is applied. Freak - Poli et al. (2013) included four of the 175 papers in the final analysis, all of which used "broad health promotion interventions, including pedometers as one of many components" (p. 13). The study therefore unearthed relevant data for this realist PhD.

It should be noted that the Cochrane Review by Freak-Poli et al (2013) was updated, revised, and published in 2020 after I completed this review. My analysis was based on the 2013 search strategy and data.

A transparent search strategy

The Freak - Poli et al. (2013) search strategy is exceptionally well documented. This means that the study can be re-run in full and/or in an adapted way that is also transparent. It is also possible to identify what is missing from the search strategy that could yield good data for a realist approach. Being able to adapt the search strategy demonstrates the potential place of a Cochrane study in a more eclectic and investigative realist approach.

Re-running Freak - Poli et al. (2013) Search

The original Cochrane Review searched within six databases:

- CENTRAL (The Cochrane Central Register of Controlled Trials, The Cochrane Library)
- CINAHL (Cumulative Index to Nursing and Allied Health Literature) – searched via EBSCO

- MEDLINE – searched via PubMed
- Embase – searched through Embase.com
- OSH UPDATE (CISDOC, HSELINE, NIOSHTIC, NIOSHTIC-2, RILOSH, IRSST and INTERNATIONAL BIBLIOGRAPHIC databases; and,
- Web of Science

There was no limit of search by language and the studies were from earliest published to date.

Re-running the original search strategy shows how the volume of potentially relevant papers about workplace pedometer interventions has grown since the 2013 Review. Table 5 provides a comparison between the search in 2013 and my search in Sept 2018:

Database	**2013 (the Cochrane study search)**	**2018 (my search)**	**% Change**
CENTRAL	671	1692	152
CINAHL	1262	1571	24
MEDLINE	1001	1491	49
Embase[1]	964	1512	57
OSH UPDATE	75	(no free access)	-
Web of Science	1154	2743	138
[1]2013 Embase searched via Embase.com. 2018, Embase searched via OVID			

Table 5: Comparison of papers found running Cochrane Review search strategy in 2013 and 2018

From a data management perspective, personal accounts were created in each of the databases and each search saved in a personal account. These searches could be retrieved by accessing the personal accounts.

Adapting the Freak - Poli et al. (2013) Search

To increase the relevance of the search to this realist study, several adaptations were made to the original search strategy. This included removing some restrictions and adding some new inclusions.

The first adaptation: remove exclusions for research design

The first adaptation was to re-run the search removing the criteria of 'randomised and controlled trials'. As discussed in Chapter Three, trials are likely to produce papers focussed on a successionist view of science – that b (outcome) follows a (intervention). At this stage of a realist review, we are interested in finding papers that have greater explanatory focus on why, how, in what contexts and for whom this may be happening. Removing the inclusion criteria for 'trials' increases the likelihood of finding more and relevant papers, by broadening the types of research included.

An adapted search removing the restriction of clinical and controlled trials was done by retrieving the saved searches in the databases and editing the full search by removing the search field for 'trials' and then re-running the search. This search was then re-named and saved in each of the databases.

The re-run search resulted in the following potentially relevant papers being identified (Table 6).

Database	**With restriction to clinical and controlled trials (2018)**	**Without restriction to clinical and controlled trials (2018)**
CENTRAL	1692	(N/A as all are trials)
CINAHL	1571	8364
MEDLINE	1001	7775
Embase[1]	1512	117599
OSH UPDATE	(no free access)	-
Web of Science	2743	19651
[1]2013 Embase searched via Embase.com. 2018, Embase searched via OVID.		

Table 6: Number of papers found with and without restriction to clinical and controlled trials

There was a significant increase in included papers after this adaptation to the search. The increased number of papers opened up the possibility of identifying substantive enough sub-sets of papers referencing the seven theories that had been identified in Stage One of the PhD.

The second adaptation: inclusion of mid-range theory

The second adaptation was based on the first adapted search with the inclusion of each of the seven theories, in turn (ie seven searches within each of the included databases). In summary, this was all of the Cochrane criteria searches, without the restriction of research design and with the inclusion of specific theories.

This was achieved by retrieving the adapted search (without restriction of research design) from each of the databases and re-running this search seven times, each time including one of the seven theories as a 'major subject heading/or equivalent'. Each of these seven searches was then saved within each of the four databases - a total of 28 saved searches.

This resulted in the following:

Database	Total after adapted search 1	Theory 1 – social cognitive theory	Theory 2 – health belief model	Theory 3 - attention restoration theory	Theory 4 – social support	Theory 5 – achievement motivation	Theory 6- self efficacy	Theory 7 – transtheoretical stages of change
CINAHL	8364	17	2	1	0	13	81	0
MEDLINE	7775	4	0	0	0	0	0	0

Embase[1]	117599	114	59	1	4	0	16	125
Web of Science	18396	8	2	4	0	0	1	12
Total (including duplicates)	168273	143	63	6	4	13	98	137
[1]2013 Embase searched via Embase.com. 2018, Embase searched via OVID								

Table 7: Number of papers identified for each of the candidate theory searches

It was unsurprising that the greatest volume of papers were returned for theories that most commonly underpin behaviour change interventions (Michie, 2014): social cognitive theory, transtheoretical stages of change, and self-efficacy.

The third adaptation: inclusion of google scholar database

Realist research seeks to explain theory using all kinds of relevant data, not only academic peer-reviewed and published data (Wong et al., 2013). The databases used in Freak - Poli et al. (2013) are likely to return almost exclusively academic published papers. To address this, a search in the Google Scholar database was included. Google Scholar is known to return 'grey literature' (for example, government reports, theses, organisation reports) as well as academic publications and papers.

The following broad search terms were used in the advanced search function in Google Scholar:

- Workplace OR Worksite OR Walking OR Step-Counting anywhere in the text
- "Specific theory name" anywhere in the text

A realist review does not require an exhaustive search, so where more than 100 records were returned, for pragmatic reasons of time and resources, the search was capped at 100. This threshold was only reached in the search for Theory 3 (Attention restoration theory).

Database	Total after adapted search 1	Theory 1 – social cognitive theory	Theory 2 – health belief model	Theory 3 - attention restoration theory	Theory 4 – social support	Theory 5 – achievement motivation	Theory 6- self efficacy	Theory 7 – transtheoretical stages of change
Google scholar		21	9	100	39	24	3	14

Table 8: Search results in Google Scholar

It was interesting and helpful that the searches for theories 3, 4 and 5 retrieved the greatest volume of papers as these had been the theories with the lowest volume of papers retrieved using the academic databases.

As with the other databases, an account in Google Scholar was set up and each of the seven searches were saved within that account. A broad search using only the terms "workplace AND walking in title only" was also undertaken first 100 records were also saved to the account.

Bringing the retrieved papers together

Each search had been saved within their respective databases and from there could be exported into reference management software. A specific group set was set up in EndNote "Stage Two Search" with a group folder for each theory (seven 'theory set' folders). The retrieved papers were exported from each of the databases into these folders to create an overall set of retrieved papers for each theory. This resulted in the following:

Theory	**Total number of retrieved papers (including duplicates)**	**Total number of retrieved papers (with duplicates removed)**
Theory 1 – social cognitive theory	164	155
Theory 2 – health belief model	72	68
Theory 3 - attention restoration theory	105	103
Theory 4 – social support	43	41
Theory 5 – achievement motivation	23	23
Theory 6 - self efficacy	101	100
Theory 7 – transtheoretical stages of change	149	146
TOTAL		**636**

Table 9: Final number of retrieved papers

Duplicate papers within each theory set were removed to achieve a final set ready for screening.

RAMESES 1 Standard 5: Developing a search strategy. "Searching in a realist review is guided by the objectives and focus of the review and revised iteratively in the light of emerging data. Searching is directed at finding data that can be used to test theory and may lie in a broad range of sources that may cross traditional disciplinary, programme and sector boundaries. The search phase is thus likely to involve searching for different sorts of data, or studies from different domains, with which to test different aspects of any provisional theory" (p.5). I believe that I have demonstrated how I have met the standard.

Screening: Inclusion and exclusion guidance

In realist research there is no requirement for absolute inclusion and exclusion criteria, the search being more intuitive to find data that can offer potential explanatory value to refine the programme

theory (Wong 2018). To provide some greater clarity about the decision-making process, general screening 'guidance' based around a standard PICOS tool was developed.

- *Population*: The study should offer insights about employees/workers. Studies may also offer some insights of value if they include adults of working ages who participate in programmes that are group based.
- *Intervention:* The study should be focussed on walking as the intervention and be using the selected mid-range theory or have relevance to that theory. However, it may also have value if the study uses physical activity or indeed another kind of health behaviour change (such as weight loss) as the intervention, providing the selected theory is evident.
- *Context:* The context should be workplaces and worksites as far as possible. Community based group work with adults may give some helpful insights but clinical contexts such as hospitals are likely to be off topic.
- *Outcome*: the study outcomes should be concerned with health in the broadest sense: physical, mental, social, and emotional.
- *Study type*: all kinds of study designs are relevant.

The initial approach was to screen based on title and abstract. This was in part for pragmatic reasons given the timescale of the project and that the total number of papers was over 600. However, after piloting with 10 papers, it was clear that it was not possible to screen based on title and abstract only as the application of the screening guidance required a more nuanced understanding of the value of the study overall. In addition, the pilot screening process indicated that papers differed in degrees and aspects of relevance rather than in overall relevance.

For this reason, screening was based on full text and an alternative approach was designed. Although it would be preferable to have all papers screened and graded by a team of researchers this was not possible for this PhD study. The intensive nature of the screening (full text of 600 papers) meant this was too onerous a task for those not involved in the study. In addition, with no fellow students or staff familiar with realist review methods, the nuanced nature of the realist thought process and screening approach meant that significant training would have been required. For these reasons, the process was done by me alone, with thorough and transparent documentation.

Screening: grading the relevance of papers

Based on reading and on the pilot, it was clear that there were three types of 'relevance':

- Relevance to population, intervention, outcome, study design.
- Relevance to explanation of context, mechanism, and outcome (in aspects as well as combinations).
- Relevance to explanation of theory (the proposed mid-range theory).

It was also clear that the relevance would be based on intuitive combinations of these factors, rather than absolute requirements for all/any. For this reason, I developed a star rating that sought to combine relevance factors as transparently as possible. This was done as follows:

- 5* - Papers that are relevant on PICOS *and* have a richness that will enable understanding of CMOs *and* help explain the theory.

- 4* - Papers that are relevant to PICOS *and* have a richness that offers depth on at least one aspect of CMO.
- 3* - Papers that do not meet PICOS *but* have some useful insights to offer CMO.
- 2* - Papers that do not meet PICOS and are not clear that they offer some explanatory value to CMO *but* offer some general background insights that could be used in other aspects of study.
- 1* - Papers that are only vaguely or tenuously relevant.
- 0* - Papers that are not relevant or appear on further investigation to be duplicates.

RAMESES I Standard 6 – Selection and appraisal of documents. "The selection and appraisal process ensures that sources relevant to the review containing material of sufficient rigour to be included are identified. In particular, the sources identified allow the reviewers to make sense of the topic area; to develop, refine and test theories; and to support inferences about mechanisms". I believe that I have demonstrated how I have met this standard.

Given that the grading was based on reading full text, it was agreed that the grading process would cease after a fixed period (the end of Semester 1 in Year 2). This pragmatic decision was made to allow sufficient time for data extraction and synthesis as well as allowing time for further necessary iteration and follow up of additional materials. The result of this decision means that data extraction is based on papers for theories 1-5.

As part of the iterative process within the programme theory development work in Stage One, it was also discussed with the Research Advisory Team that Theory Seven may be dropped from the study (see Chapter Four) as it was felt that Paths for All staffs' awareness of health behaviour change programmes using the transtheoretical model was better than other areas and therefore there may be less to learn from pursuing this strand of theory. Theory Six was pursued but with reference to other substantive mid-range behaviour change theory.

Theory	**Total number of retrieved papers (with duplicates removed)**	**5***	**4***	**3***	**2***	**1***	**0**
Theory 1 – social cognitive theory	155	18	15	14	13	34	60
Theory 2 – health belief model	68	2	1	3	2	4	56
Theory 3 - attention restoration theory	103	11	8	20	27	20	17
Theory 4 – social support	41	7	4	11	4	3	12
Theory 5 – achievement motivation	23	1	2	0	3	3	16
Theory 6 – self-efficacy	100						
Theory 7 – transtheoretical stages of change	146						

Table 10: Total retreived papers and graded relevance

The benefit of full text screening was also that it was possible to get a feel for the quality and relevance of the material as a whole. It was concluded at this stage that the small number as well as the relevance of papers returned for Theory 5 (Achievement Motivation Theory) meant that perhaps an alternative theory could better explain that aspect of the programme. For that reason, an additional search was undertaken using self-determination theory. The results of this search are in Table 11 below:

Replacement Theory 5 – Self Determination Theory	109	19	7	6	10	21	46

Table 11: Alternative Theory Five search result

As self-efficacy is a major construct within Self Determination Theory, these data also supported the work to refine Theory Six and therefore the findings are presented as a combined set of data with the two different theories teased out within the analysis.

In relation to Theory Two (Health Belief Model) there was a similar issue of a small number of highly relevant papers. It was noticeable for this theory that many papers were excluded (82%) as they related to clinical populations and clinical settings and were largely based on controlled trials that provided limited explanatory insight. An alternative theory was identified as potentially valuable – Self Discrepancy Theory. It was agreed in the Research Supervision Team that if time became available and the relevance of the theory became more significant to refine and explain the proposed CMO, then a further search may be undertaken. In the end, the data already gathered was adequate to provide some refinement of the theory.

This approach of reconfiguring and replacing theories felt very much in keeping with the investigative and iterative nature of a realist review.

Findings and discussion

The results are based on the following findings:

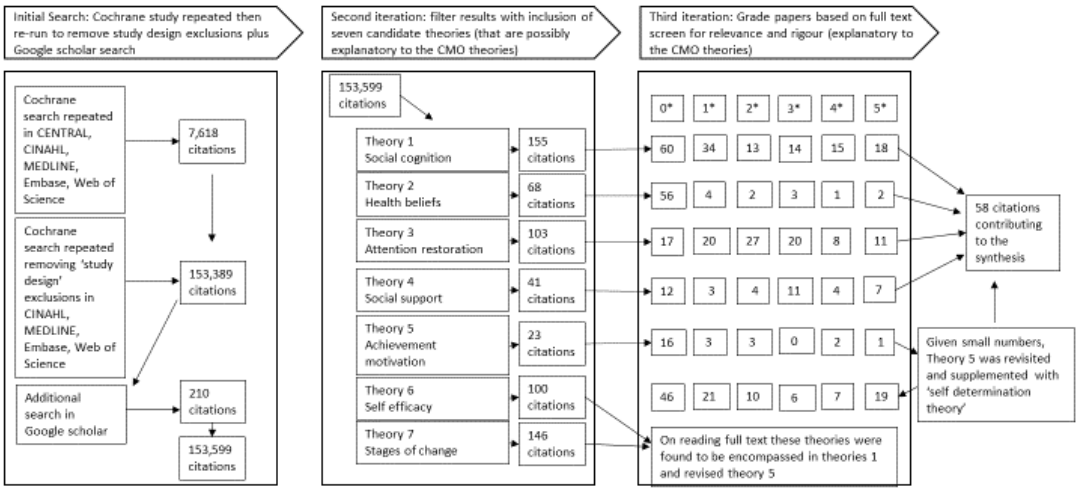


Figure 7: Overall searching and screening results

Specific findings for each of the theories and a discussion of these findings is presented on a theory-by-theory basis below.

Theory One – Encouragement to get up and walk around

The following papers were identified using the search strategy described in the section starting on page 54.

Total number of retrieved papers	**5***	**4***	**3***	**2***	**1***	**0**
155	18	15	14	13	34	60

Table 12: Theory One retrieved and graded papers

Of the 155 papers identified, 18 were graded as 5* and included in this stage of the review. Among these 18 there were ten intervention studies, five reviews, one pilot study and two theses.

The richer insights and refinements to the programme theory were informed largely by data from the two theses. Two of the review studies also offered valuable insights. The intervention studies provided very limited insights. One PhD Thesis from Theory Two (Sudholz, 2014) and two papers from Theory Four, Niven and Hu (2018) and Brinkley, McDermot, and Munir (2017), were also useful in adding explanation to this programme theory.

Integrating synthesis findings with findings from Stage One

At the end of Stage One the proposed programme theory in a realist configuration was:

> *"In a context of sitting for long periods of time at work (C), the Step Count Challenge encourages and offers a sense of 'permission' (M) to take an active break from work, resulting in feeling refreshed and mentally restored (O)"* and social cognitive theory was identified as a potential explanatory theory.

In reviewing the data from the identified papers, two contextual issues were identified as pertinent: workplace culture and leadership. The construct of collective efficacy was also identified as particularly relevant to understanding the mechanism and the outcomes. These are now the focus of the synthesis below.

Context of workplace culture

Although Social Cognitive Theory is a theory of effective self-management (Bandura, 2004) these data helped to clarify that the original programme theory operates primarily at the workplace level. These data suggest the culture of sitting at work shapes our belief that moving around would not be looked upon favourably. In that context, even if we know moving around is good for us, our self-efficacy is thwarted. For some whose self-efficacy remains high, walking outside of the workplace context may be a goal, for others it could result in minimal physical activity.

In her study of desk-based employees' and managers' sitting and sitting breaks, Sudholz (2014) provides evidence of this culture, "*Workplace sitting was found to be highly habitual, and sitting habit predicted increased workplace sitting time. The high habitualness of sitting is not surprising considering the workplace environment constrains sitting, and the importance of stable environmental cues for habit formation*" (p.101). Several studies (Delaney, 2010) (Brinkley, 2017)

also highlighted how workplaces can continue to reinforce the culture of sitting, even when they are overtly signed up to health promotion and increased physical activity in their workplace.

Perez-Calhoon (2017), in her thesis, conceptualised this as a lack of collective self-efficacy: *"… institutions with staff that judge themselves collectively powerless to attain a desired walking goal conveyed a health and wellness futility that can pervade the entire institution"* (p.102). Delaney (2010) provides insight into how deep-rooted this cultural barrier can be when she describes how even motivated individuals are reluctant to commit to their goals because of the perceived lack of commitment from their employers.

However despite there being evidence that sitting at work is a habitual and almost non-discretionary activity (Sudholz, 2014), other data points to the role that managers and leaders could play in challenging that culture. In Niven and Hu (2018) they found, "*a number of comments related to how an increased acceptance of the behaviour and engagement in the behaviour, particularly from managers, would help create a culture change (n = 34) that would make it easier to break up sitting"* (p.23).

Employer leadership and its role in context

Just as these data demonstrate that workplace culture influences individual behaviour, these data also show that managers and employers can intervene to change this. Keeping with the explanatory model of Social Cognitive Theory, these data suggest that managers can create more facilitative environments as well as personally modelling the desired behaviour in ways that can shift staff expectations and influence behaviour. Staff may be more inclined to think their walking may be recognised or rewarded, if it is a behaviour that their manager models at work.

Perez-Calhoon (2017) concluded that "… *both individual and teamed participants benefited from engaged leaders who championed the cause… during the walking challenge*" (p.109). However, Sudholz (2014) data suggests that in a context of workplace sitting, managers themselves, may perceive barriers differently to employees. She found that managers believed that employee motivation and energy and employee stress were the key barriers to taking more breaks from sitting. In this context, it is possible that managers would not be convinced of the value of modelling the behaviour as they perceive other factors to be more important.

Delaney (2010) paraphrasing Dishman et al (2009) stated that Dishman had found that it may require a workplace-wide effort, with more distributed leadership, to fully engage all staff at all levels to tackle perceived impediments to the achievement of perceived goals. Perez-Calhoon (2017) reached similar conclusions in her thesis, with a clearer exposition of the explanatory potential of the Social Cognitive Theory:

> *Teaching employees about how to raise one's self-efficacy and encouraging participation in wellness activities with tangible, realistic results may support those with lower self-efficacy toward exercise and healthy behaviours. Thus, the second implication for action involves creating an environment to raise perceived self-efficacy of employees through vicarious experiences such as observing others managing task demands successfully with interventions that involve a buddy system or team with a diverse group of individuals to allow those with higher efficacy and readiness to influence those with lower self-efficacy through modelling.* (p.111)

The culture of sitting at work is not the only impediment to more walking at work and so the idea of having diverse groups of individuals modelling the desired walking behaviour is helpful. In fact, as Delaney (2010) found in her study, "*all of the participants who took part in the focus groups,*

interview, and email responses reported difficulties balancing work, family, and physical activity. This was a primary barrier for participants trying to hit the 10,000 or more moderate-vigorous steps per day" (p.64).

These data therefore suggest that finding time for physical activity is perceived to be difficult (a barrier) and the culture of workplaces habituates sitting (an expectation that moving is not normal and would not be rewarded). These data also suggest that managers and employees may have differing perspectives on what would best help support them to reach physical activity goals. Given these possible differences, the idea that diverse and widespread engagement in the planning and execution of the activity may lead to better outcomes is plausible. It may also in part be explained by a further aspect of Social Cognitive Theory – collective efficacy.

Mechanism of collective efficacy

Bandura (1997) explained that collective efficacy may be a "*better predictor of exercise than their [employees who exercise] individual levels of perceived efficacy*" (p. 416). This supports the line of argument that leadership throughout a workplace is important to achieve workplace physical activity goals. Indeed, Umstattd, Baller, Blunt, and Darst (2011) found that "*those using more self-regulatory strategies (eg, self-monitoring, goal setting, eliciting social support, reinforcement, time management, and relapse prevention) and with greater PA social support from friends had greater perceived worksite environmental support"* (p.S266). This suggests that the broader aspects of social and environmental support at work matter, even in a context of significant personal self-regulation.

However, Perez-Calhoon (2017) notes from her study that "*Although there are emergent benefits to collective efficacy, the findings did not show statistically significant differences between individual participants and those who participated as a member of a team*" (p.103). Further, and similarly, Delaney (2010) found that "*Employees were prompted to create lunch hour walking groups, perform workouts together, utilize each other as support systems etc. and none of this information was translated into practice*" (p.66).

The data about collective efficacy is plausible and could inform a further iteration of the programme theory. It is possibly theoretically stronger at the level of workplace/worksite than it is at the level of 'work team'. Given the data that indicates a lack of collective efficacy at the team level, this will be an area that is a focus for further exploration in the next stage.

Outcome of moving more

The specific outcome of the initial programme theory was to 'feel refreshed and mentally restored'. This outcome is explored more deeply in Theory Three (Attention Restoration Theory).

Among the reviewed papers for this theory there was evidence that participation in workplace walking programmes could generate physical activity outcomes, where the workplace was supportive of staff walking. The review of workplace interventions to increase physical activity by Malik et al. (2014) provides a range of evidence that workplace walking programmes can deliver increased walking and suggest that even just adding encouragement may provide a sense of permission to walk around at work.

Umstattd et al. (2011) reported specifically that their "*Findings support the social cognitive perspective that the perceived worksite environment is independently related to PA [physical activity]*" (p.226). Umstattd et al. (2011) measured perceived worksite environmental support using SEALs (Worksite Supportive Environments for Active Living Surveys), a validated tool to assess supportive worksites for physical activity. This allowed them to conclude that employees who had higher SEALs scores were more physically active, regardless of other factors. Thus, it is plausible to

amend the programme theory to indicate that increased physical activity could result from a supportive workplace.

Malik et al. (2014) offer a further explanation for why increased physical activity may result from supportive worksites. They state that *"this could be that interventions that provide individuals with an opportunity to engage in physical activity during their working day also help to overcome the commonly cited barrier to exercise participation: lack of time*" (p.172). This is supportive of the idea that leadership and active participation can provide models of how to overcome key barriers.

Refinements to Theory One

The key learning from this stage of the review is that this mechanism is more likely to operate at a workplace, rather than and individual level. As such the proposed revised CMO is:

> *In a context where employers have embraced the need to address the health and wellness of their employees (C) signing up to the Step Count Challenge provides a way to demonstrate their leadership and commitment to physical activity (M) resulting in more staff signing up to the challenge (O)*.

This provides a link to a further refinement of the CMO:

> *In a context where multiple employees sign up to the Step Count Challenge (C) there is a sense of collective efficacy (M) that they can overcome work-related barriers to moving more and sitting less.*

Taken together and drawing on Social Cognitive Theory, they contribute to understanding how the Step Count Challenge might work at a workplace level to encourage people to sign up to the challenge.

Theory Two - A desire to get back to better health

The following papers were identified using the search strategy described above.

Total number of retrieved papers	**5***	**4***	**3***	**2***	**1***	**0**
68	2	1	3	2	4	56

Table 13: Theory Two retrieved and graded papers

The majority of papers that were identified were rated '0', being wholly off-topic. This was largely because the subject of the research related to clinical populations, clinical conditions and often with a focus on specific medical interventions delivered in healthcare settings. Whilst it is the theory and not the intervention that is being reviewed, it was challenging to see the generic relevance and transferability in most of these papers.

The Health Belief Model, as operationalised in the reviewed research, was therefore not helpful enough to explain the preliminary programme theory. However, Self-Discrepancy Theory (Higgins, 1987) was identified through this search process and it appears to have some explanatory potential. Given time constraints for this stage of the research, I did not pursue further searches about this theory but that would have been a good next step, had time allowed. The one reference to this did though provide some rich enough insights to be able to consider its merits.

Of the two papers included in this stage of the review, both were Doctoral Theses. Data was extracted from Sudholz (2014) but was largely relevant to Theory 1 (Social Cognitive Theory) and data from Wilson (2014) was largely coded to Theory 5 (Self Determination Theory). A single study within the Sudholz (2014) thesis specifically addressed perceptions of health status and some of these data were coded to Theory 2. The most helpful explanatory data for this CMO was found in a paper (Walton, Macdermid, & Nielson, 2010) that was identified as 5* for Theory 5.

Integrating synthesis findings

The CMO programme theory as proposed at the end of Stage One was:

> *In a context where someone is aware of the need to improve an aspect of their health (C), the opportunity of the Step Count Challenge can align with that need and be a supportive structure to start building confidence (M) that they can return to a better state of health (O).*

There were two key ideas that emerged from the review that helped to clarify that achieving a state of good health is more figural for participants than getting away from the state of poor health. I have expressed these in two ways – the asset of good health and personally determining how much of the health asset is required to feel satisfied.

The mechanism of desiring the asset of good health

Even the limited data from this Stage Two review confirm the initial CMO is plausible and explain how having thoughts about improving one's health can be motivational. However, more specifically, the data suggest that it is the asset of good health and what can be done with it, rather than improving poor health, that triggers motivation. As Walton et al. (2010) explains,

> *We do not desire health for the sake of being healthy, just as we do not desire weight loss for the sake of weighing less. Health is desirable at least in part because it affords us resources we can use to defend against threats to identity, to achieve personal goals and experience positive emotional consequences (novel and creative actions, ideas and social bonds).* (p.869)

Higgins (1987), in his Theory of Self-Discrepancy, further explains that we are motivated to achieve the level of health that provides us with the potential to make choices (autonomy), even if we do not exercise the choice. His theory explains our need for balance between how we perceive our 'actual', our 'ought' and our 'ideal' selves. Walton et al. (2010) explains how this works,

> *We are motivated to maintain or achieve a threshold level of health to at least possess the perceived potential to attain some ideal, satisfying version of ourselves, regardless of whether, or not, we choose to mobilise our resources and achieve that, ideal self. A deviation from health, as in the case of injury, in which we suddenly perceive ourselves as less able to fulfil the roles we ought to be fulfilling, would serve as motivation to work towards bringing the actual self, more in line with the ought self, and to regain a sense of well-being or life satisfaction. On the basis of these arguments then, the end of the injury experience should occur when we feel we have once again achieved a level of satisfaction with our perceived self, which, based on the theories described, must be congruent with our idea of the ought and ideal self.* (p.870)

This explanation has enough richness and theoretical validity to allow us to further revise the CMO and develop a CMO chain:

> *In a context of injury or illness (C), the discord/discrepancy that we feel between our actual and our ought selves drives us (M) to join an intervention that we perceive will help us to recover/improve (O).*

> *In a context of being in an intervention that we find is supportive when we are seeking to 're-condition' (C), the sense of growing alignment between our 'actual' and our 'ought' selves (M) keeps us in the intervention (I).*

This idea of CMO 'chains' and nested CMOs has been identified by Gil Westhorpe (2012) as valuable and consistent with complex adaptive system thinking. She has advocated that realist work can usefully be informed by these considerations as a small shift in one aspect (joining an intervention relevant to our health needs) can lead to a small shift in another (sticking with an intervention until we benefit from it).

Achieving the asset of good health

Linked to this idea of health as an asset is the idea that the amount of health required to be an asset is self-determined and not externally prescribed. Selected as one of the 5* papers for Theory 5, Walton et al. (2010) set out the connection between the theories of self- discrepancy and self-determination:

> *Deficiencies in autonomy, competence and relatedness are all conceivable effects of injury. For example, injury often leads to stress on traditional relationships, either employment-related, recreational or spousal. SDT appears to hold consistency across cultures has found empirical support and, along with Higgins' self-discrepancy theory, provides a solid framework from which to discuss the goals of the injured person in relation to recovery from injury and the end of the injury experience* (p.870).

The process of recovery (or health improvement), through participation in an intervention such as the Step Count Challenge, is therefore likely to be dynamic. It is suggested by Walton et al. (2010) that the process starts with an 'ought/ideal' sense of self and ends when one is satisfied with oneself, even if not the 'ideal' self that was initially visualised. The implication of this is that people will only be motivated to their personally determined point of perceived equilibrium, which is not a fixed point, but is dynamic over time. As Walton et al. (2010) concludes, "*We propose a different conceptualisation of recovery as the end-point of the injury experience, captured through satisfaction with the present and expected future self*" (p.871).

This explanation enables further proposed refinement to the CMO programme theory:

> *In a context of being in an intervention that we find is supportive when we are seeking to 're-condition' or recover (C), reaching a point when we feel an equilibrium between our 'actual' and our 'ideal' selves (M) means we may choose to stop participating in the intervention (O)*

Although the extracted data did not demonstrate that the opposite would also be true, the theory proposed leads me to propose that there could also be a negative pathway:

> *In a context of being in an intervention that we find is supportive when we are seeking to 're-condition' or recover (C), reaching a point when we feel we are not achieving an equilibrium between our 'actual' and our 'ideal' selves (M) means we may choose to stop participating in the intervention (O)*

In either case it seems logical in the application of this theory, that when a point of 'health improvement' has been achieved through the intervention or behaviour, then the behaviour will stop. The explanation being that the behaviour was a means to an end and the end is a state of homeostasis or equilibrium. That state may or may not be achieved through the intervention and within the period of the intervention. However, other theories may interact or influence this.

Refinements to the programme theory

These limited data were nonetheless valuable in explaining how personal health is an asset that we use to achieve our goals and how externally defined health may not be the end goal. This seemed to support the blog data from Stage One where participants talked of wanting to be able to achieve things such as a better time with their children, because of improving their health. This was couched in terms of 'getting back in shape'. The sense of being in shape being a self-determined 'shape' is also relatively easy to accept from a theoretical perspective. Overall, there appeared to be a dynamic quality to health as something that moved in and out of balance through time.

The refinements made in previous paragraphs are therefore presented below, with a sense of the dynamic and connected nature of these ideas.

Signing up

> *In a context of injury or illness (C), the discord/discrepancy that we feel between our actual and our ought selves drives us (M) to join an intervention that we perceive will help us recover/improve (O).*

Sticking with it

> *In a context of being in an intervention that we find is supportive when we are seeking to 're-condition' (C), the sense of growing alignment between our 'actual' and our 'ought' selves (M) keeps us in the intervention (I).*

Leaving when it makes sense to do so

> *In a context of being in an intervention that we find is supportive when we are seeking to 're-condition' or recover (C), reaching a point when we feel an equilibrium between our 'actual' and our 'ideal' selves (M) means we may choose to stop participating in the intervention (O.)*
>
> *In a context of being in an intervention that we find is supportive when we are seeking to 're-condition' or recover (C), reaching a point when we feel we are **not** achieving an equilibrium between our 'actual' and our 'ideal' selves (M) means we may choose to stop participating in the intervention (O).*

These will be explored further in Stage Three.

Theory Three – Blowing away the cobwebs

The following papers were identified using the search strategy described above.

Total number of retrieved papers	**5***	**4***	**3***	**2***	**1***	**0**
103	11	8	20	27	20	17

Table 14: Theory Three retrived and graded papers

The search strategy resulted in a total of 103 publications. The eleven top graded 5* publications all contained significant, rich, explanatory data. Other papers had many useful and interesting insights on specific aspects of the CMO and is a rich data set to return to for further or future study beyond the timelines for this PhD.

Of the 11 papers included in this stage of the review there were nine intervention studies, one review and one book.

Among the intervention studies only two were randomised trials. This was unlike the interventions found in the searches for other theories, especially theories used in health behaviour change. Other interventions were qualitative designs and mixed methods studies. Given the richness of these studies, data was extracted from all eleven publications.

Integrating synthesis findings

The proposed CMO programme theory at the end of Stage One was:

> *In a context where people spend significant time indoors (C), the Step Count Challenge provides a reason to get outdoors (I) which can result in pleasure and relaxation from re-connecting with the natural environment (M), reducing stress and increasing productivity (O).*

The reviewed literature included data about people's context of stress and their need for restoration. These data also commented on the nature of the environment and activity required to achieve this restorative experience. There were also data that were relevant in the specific context of workplace health relating to how addressing attention restoration could produce outcomes that were more consistent with what is regarded as reasonable behaviour.

This specific Theory had a large volume of rich data. Given that this is not a behaviour change theory that is commonly encountered in physical activity literature, I have decided to present slightly more of these data, to demonstrate its potential value to understanding more about the links between walking and nature. This is a theme that is of particular interest to Paths for All.

Context of stress

Within the included papers there were data that explained who this theory may work for in terms of who is likely to be in a context of greatest stress. The data addresses two groups within the idea of 'for whom': firstly, who is most likely to use the outdoors for restoration at work and secondly, among those who use it, who is likely to get the most benefit. There is also some limited insight about who is less likely to use and benefit from the outdoors at work and some suggestions about why. The papers by Colley, Brown, and Montarzino (2017), de Bloom et al. (2017) and Lottrup, Stigsdotter, Meilby, and Corazon (2012) have a specific focus on this question and most of the extracted data on the context of work-related stress is from these papers.

As a theory that addresses the need for attention restoration, it is axiomatic that whose attention is drained or depleted would be the focus of study. As Colley et al. (2017) have noted, "*desires for restoration are often a key motivator of greenspace use"* (p.317) and *t*heir research went on to find that, "*a series of regression models suggested that job stress was positively related to levels of greenspace use and restoration benefits"* (p.314) (Colley et al., 2017).

The papers selected to refine this CMO suggest that psychological demands and job stress can be generated from; the type of work someone does, the type of job role they have, the nature of the workplace, as well as the personal characteristics and circumstances of the employee. Such different aspects of job stress featured in the selected papers. Gill, Packer, and Ballantyne (2018), note that emotionally demanding work is likely to benefit from use of greenspace. Colley, Brown, and Montarzino (2016) suggest that those with cognitively demanding work may also experience greater stress and therefore obtain greater benefit from the use of greenspace.

Colley et al. (2017) found that those reporting higher stress levels experienced stronger restoration effects. This confirms the idea that restoration works best for those in greatest need of restoration. However, despite the likelihood of stress being dynamic and widespread, some roles and times in life may be more stressful than others.

In the trial by de Bloom et al. (2017) *they "recruited workers with knowledge-intensive and emotionally demanding jobs as it is probable that job stress and recovery problems concern such workers",* (p.17) They found that *"park walking seems slightly more beneficial for older than for younger workers*" (p.23) (de Bloom et al., 2017). They also reported that *"the rise in restoration during lunch breaks was greater for older participants" and "fatigue in the afternoon improved more during the intervention period for older workers in the park walking group than for younger workers"* (p.21) (de Bloom et al., 2017). However, Lottrup et al. (2012) found no age-related differences.

In Lottrup et al's (2012) study they reported that *"data from all six companies showed that male respondents had 2.083 times higher odds of spending time outdoors more than once a week than female respondents ($p < 0.001$).*" (p.162). Colley et al. (2017) found a more specific seasonal gender difference, noting that, "*female respondents were around half as likely as males to report using the greenspace at least once a week in winter, and again were half as likely to spend at least an hour a week there in winter"* (p.325).

In summary, it seems that those who will get the greatest benefit from walking at work and accessing the opportunity for attention restoration are those who are stressed at work. This stress could come from a range of work-related and/or personal factors. However, the data indicates that those who are most likely to use the opportunity to reduce their stress by using the outdoor for a walk are men and older adults.

This data has led to some refinement of the CMO by allowing us to define the stress related to particular roles as part of context within which the mechanism of 'escape' is generated:

> *For those who work in roles which are emotionally and cognitively demanding and who may experience work-related stress as a consequence (C) participating in an intervention that encourages walking outdoors (I) provides an escape from the stressors (M) and provides a place where balance can be restored (O).*

For women, the opportunity may not be available to them because of barriers due to demands on their time as well as the availability of safe and secure natural environments (perhaps perceiving the opportunity to be unavailable to them). It is argued that it is not the theory of attention restoration or its relevance that fails women but practical barriers that are addressed in other CMOs that are better explained by other theories.

For younger people, it may be that either they experience fewer or different work-related stressors (a different context). It could also be that they prefer other types of opportunities to address their stress (perhaps more social sharing and contact – walking to get a coffee or lunch together). This latter point may be addressed in other theories, such as team-work and social support.

Context of the design and quality of outdoors

Colley et al. (2016) have delved deeply into specific qualities of the environment that may be needed to achieve attention restoration. Their study helps us to understand aspects of the physical context that may be required for attention restoration. However, it is also related to the mechanism, in that the generative act of restoration appears to be embedded in the specific experience of the nature. The following paragraph from Colley et al. (2016) explains this:

> *There were several themes linking these areas that may help to explain why these were more often associated with feelings of restoration. The fascination elicited by the array of sensory stimuli—the sights, sounds and smells of these semi-natural and naturalistic spaces—was seen as central to the feelings elicited during the experience. Opportunities to see and hear wildlife, along with the ephemeral affordances and dynamic qualities of these environments, were highlighted as key sources of fascination. Furthermore, these spaces attracted users by virtue of their physical and visual separation from the workplace and the opportunities they offered for social escape, both seen to contribute to the feeling of being away, or achieving psychological distance from work and social stressors* (p.613).

R. Kaplan and Kaplan (2011) describe the nature of the environment required for restoration, explaining that, "*there is no requirement for vast areas, for pristine nature, for manicured gardens, for expensive maintenance. The amount of requisite nature can be modest in physical and temporal scales, but it needs to be readily available*" (p.318). Colley et al. (2016) also explain that "*when under stress, people tend to prefer greenspaces with the perceived quality of 'nature on its own terms', that is, where natural forces rather than human agency are seen to dominate*" (p.611).

These data allow for further refinement of the CMO by qualifying the kind of outdoor environment that is required (context) for the sense of 'escape' (the mechanism) to be experienced:

> *For those who work in places where there is easy access to modest nature spaces and who have roles which are emotionally and cognitively demanding and who may experience work-related stress as a consequence (C) participating in an intervention that encourages walking in that environment (I) provides an escape from the stressors (M) and provides a place where balance can be restored (O).*

Access to nature as a necessary but insufficient context

Having readily accessible places with natural features may be necessary to access the opportunity to restore attention but is unlikely to be sufficient to encourage participation for all. As was found in the papers that helped to refine the CMO Theory One, leadership was also identified as important in the papers refining this theory. As Barton, Bragg, Wood, and Pretty (2016) note, "*the quality and accessibility of local green space is important but it may be that individuals require more facilitation to undertake green exercise*" (p.52). In their trial Lottrup et al. (2012) also found: "*respondents who reported encouragement to use the outdoor environment had 3.1 times higher odds for spending time outdoors more than once a week than respondents who did not report encouragement by their colleagues ($p < 0.001$)* (p.164)

The same leadership context as in Theory One also seems to be important for the generation of the permission to physical leave the workplace during the working day to benefit from the opportunity to restore attention. Therefore, a refined CMO could be:

In a context where employers have embraced leadership for the health and wellness of their employees (C) staff feel empowered to leave their workplace (M) allowing them to escape stressors and restore attention (O).

Context of being alone or with others in nature

Overall, the data indicated that being alone in nature is a more conducive context for attention restoration than being with others. As Colley et al. (2017) notes, *"In the absence of a perceived risk to safety, visiting alone is likely to be more conducive to effective restoration"* (p.319). In contrast, "*those who reported spending most of their time outdoors in the company of others tended to report*

lower restoration outcomes as a result of using the open space at work, in line with previous research" (p.333) (Colley et al., 2017).

In contrast, Rogerson, Gladwell, Gallagher, and Barton (2016) suggest that the social experience of physical activity may act as more of a motivator than the potential health gains of the activity (presumably including restoration). Their works states, "*Differences in social experiences between exercise environments are important; individuals are more successfully persuaded to partake in physical activity by potential social opportunities associated with exercise sessions than by health benefits. Therefore, green exercise might promote future exercise behaviour by facilitating social interaction and increasing enjoyment of participation"* (p.2).

To refining the CMOs it is likely that being alone and being with others are different contexts that generate different mechanisms and outcomes whilst being ostensibly the same kind of physical activity in the same green setting. In the case of the Step Count Challenge and the specific programme theory about restoration of attention, it seems the evidence points towards being in a context of walking alone. Other theories, such as Theory Four, deal with the contribution of social contact and relatedness to others as a form of motivation. Given the prominence of 'walking meetings' in the narrative of workplace walking challenges, it will be important to further clarify this.

Links between restoration, frequency of nature exposure and self-regulation

Hyvönen et al. (2018) have specifically considered the relationship between the frequency of employees' exposure to outdoor environments and outcomes of employee wellbeing. Their study suggests that there is a relationship between frequent exposure to nature, burnout, and work engagement. Specifically Hyvönen et al. (2018) found that "*frequent opportunities for nature exposure at work as well as during leisure time can be related to higher vigor and dedication, and in turn lower cynicism and professional inadequacy*" (p.12). They go on to explain that these work-related outcomes are possible, not only as a consequence of recovering and restoring cognitive function, but possibly also by increasing mastery and control (Hyvönen et al., 2018).

Barton et al. (2016) also suggest that taking breaks in nature enhances perceived control. In their review of the benefits of green exercise they comment that"*an added benefit of taking a break in a natural space for the employee is that they feel they take back some control of the structure of their day. By the employee managing the structure of the day this may help alleviate work-related stress that usually results from the employee not feeling in control" (*p.36).

These findings allow for a refinement of the CMO and provide a link to other CMOs and theories regarding mastery, control and self-regulation.

> *For those who work in places where there is easy access to modest nature spaces and who have roles which are emotionally and cognitively demanding and who may experience work-related stress as a consequence (C) participating in an intervention that encourages frequent breaks to walk in that environment (I) provides escape from the stressors of work creating a pause when demands cease and energy is restored (M) which when repeatedly experienced gives an increased sense of self-regulation/control, resulting in higher vigor and dedication, and lower cynicism and professional inadequacy (O)*

Outcomes and Kaplan's reasonable person model

In 2011, R. Kaplan and Kaplan (2011) added to their theory of Attention Restoration with a conceptual model they named the 'Reasonable Person Model' (RPM). The RPM is designed to address their belief that wellbeing (as an outcome of attention restoration) is hampered by information overload and consequently, our reasonableness is compromised. Their proposition is

that to be reasonable requires us to be able to build mental models, to be effective and to act meaningfully and that being in the natural environment can support us to be more reasonable.

This model could help to refine the context of 'stress' by linking it more clearly to information overload. This allows the identification of more specific context and outcomes for the Step Count Challenge and the generative mechanism (i.e., the detachment from work stressors and restoration of attention through nature) is the same.

> *In a context of feeling stressed out by information overload (C) the Step Count Challenge presents an opportunity to go for a walk in nature (I) which provides an escape from the stressor and (O) restores our ability to build mental models, be more effective and act meaningfully, thus restoring our ability to be a reasonable person.*

Theory Four – Teamwork and support of colleagues

The following papers were identified using the search strategy described above.

Total number of retrieved papers	**5***	**4***	**3***	**2***	**1***	**0**
41	7	4	11	4	3	12

Table 15: Theory Four retrieved and graded papers

The search retrieved a total of 41 papers of which seven were 5*. These seven included a conference paper, a book chapter, two doctoral theses, two qualitative studies and one survey. Data was extracted from all seven studies, with the two doctoral theses providing the richest data.

Of the papers not reviewed, most did not have enough depth and richness to explain social support and how it might be working in the context of the Step Count Challenge. Also, in most papers, the interpretation of social support was based more on a definition of giving care and supporting people to cope during times of extreme stress or illness.

Integrating synthesis findings

The proposed CMO at the end of Stage One was:

> *In a context where people are often busy or work alone (C), the Step Count Challenge offers an opportunity to form a new team (I) which can lead to feeling more connected to and supportive of each other (M) whilst working together on the shared task of increasing their physical activity (O)*

In the reviewed data there were clear links to two specific concepts that helped to explain and refine this theory: accountability and the value of networks in the workplace. The outcome of increased physical activity was also refined.

Mechanism of teamwork and accountability

The study by Donnachie, Wyke, Mutrie, and Hunt (2017) and the doctoral thesis of Perez-Calhoon (2017) provided some of the richest data to explain what Lakey and Cohen (2000) have described as a social constructionist/social cognitive approach to social support. That is, that people's perceptions of how supportive others will be towards them has more effect on behaviour, and ultimately their health, than the actual social support given in a group.

Donnachie et al. (2017) in their study of football fans on a physical activity and weight management programme, 'Football Fans In Training', (FFIT) describe how "*the people, including the community coaches and other men on the programme perceived as being 'like them', provided a combination of facilitative and supportive roles*" (p.6). In the context of working with a group that had people 'like them', being accountable to others was then important to their success.

Donnachie et al. (2017) go on to say more about the specific nature of this accountability in the group *"they seemed to feel accountable to other group members. For these men reaching their step-based targets, combined with a perceived need or desire to report back to the group, was described as particularly motivating"* (p.6). Similarly, Perez-Calhoon (2017) found a strong relationship between team work and a motivational climate for individual behaviour change. In her doctoral study, one of the participants describes how, "*You want to be there for the sake of your team. You want to keep up with everybody else. It's fun because everyone else was motivated. It keeps me motivated. I had a lot of fun doing that"* (p.96).

Although the study by Donnachie et al. (2017) was not a workplace intervention, it is likely that workplaces, as a context, have greater potential for this kind of team work mechanism to work. As Malik et al. (2014) have noted *"it may be that within a workplace setting, social influences play a greater role in an individual's health behaviour choices than individual factors alone"* (p.172).

Perez-Calhoon (2017) explains how her study may be very similar to the Step Count Challenge and how the mechanism of team-work may relate to both individual and collective self-efficacy, "*the accomplishments of a walking team were the sum of successes achieved independently, therefore acting like individual participants despite being members of a team … Consequently, the participation of employees as members of a team to reach and attain health outcomes and team goals was supported through collective efficacy and individual self-efficacy"* (p.105).

As members of the Step Count Challenge have individual goals that accumulate towards a team score, the idea that success depends on both individual and collective efficacy seems highly plausible. The presence of individual step count accountability towards a team goal also potentially prevents other negative social processes, such as social loafing, that could emerge in competitive team tasks. In their meta-analysis of social loafing, Karau and Williams (1993) explain this is likely to be because the task is co-active rather than collective – that is the individual contribution to the team output can be identified.

This sense of accountability to team members and visibility of individual contributions to the team score is not so much a refinement of the existing programme theory but adds a new theory at the team level. The proposed new theory is:

> *In a context where the performance of the Step Count Challenge team is judged by the aggregated performance of visible individual scores within the Step Count Challenge team (C) a sense of accountability between team members spurs people on (M) and results in people doing more steps than they may have without the visibility (O).*

Aiello and Douthitt (2001) suggest that the presence of others in a collective task (social facilitation) can be performance enhancing, if the task is a simple one and performance impairing if the task is complex. Given the Step Count Challenge task is to achieve step counts, for some who feel confident to walk more, this team-work theory may work, but for others who feel less confident this theory may work negatively. This is an area for further investigation in Stage Three.

Mechanisms and the value of networks in the workplace

In addition to the idea that individual and collective self-efficacy can work through a team to create a climate of accountability for health behaviour change, the data indicated that there was some alignment with the relationships constructs of Lakey and Cohen (2000). Brinkley et al. (2017), in their evaluation of 'Changing the Game' (CTG), a London 2012 Olympic-inspired workplace sport intervention suggest the use of 'social capital' as an asset from participation. They reported that "*Frequently, a network within the organisation was identified as a result of an improved relationship"* (p.476) and that staff in Brinkley et al's study (2017) reported that "*it opens up channels of communication within the organisation that you wouldn't necessarily have or have been able to have used*" (p.476). Stage Three could explore the extent to which social capital (networks as an asset in the workplace) as distinct from the companionship of colleagues and friends are distinct theories that motivate some people more than others in some contexts.

Outcomes for team-work and physical activity

There were also data that demonstrated that those walking in groups (that they regarded as supportive groups) walked more than those who were walking in their own. Torquati, Kolbe-Alexander, Pavey, Persson, and Leveritt (2016) stated that "*A recent intervention study showed that PA increased more in a walking support group and pedometers compared to the pedometer-only group (10,064 vs. 12,472 steps/day; p < 0.05)"* (p.279). Perez-Calhoon (2017) provides a possible explanation being the added value of collective efficacy. She reported that "*Those who participated as a member of a team averaged 25.2 points higher collectively on the BARSE [The Barriers Specific Self Efficacy Scale] than individual participants"* (p.103).

Although the extracted data was limited in its explanatory potential, it seems likely that those walking as teams may generate more steps and achieve a better physical activity outcome than those walking individually. As such the CMO as proposed at Stage One would still stand.

Theory Five – Competition and Theory Six – Peer pressure

In Stage One there were two theories (theories five and six) that were originally treated as separate theories that could perhaps be explained with reference to different mid-range theories (at that point, 'achievement motivation' and 'self-efficacy' theories were being explored). After an initial search, it was agreed in the Research Supervision Team to approach these two theories in a combined way and use self-determination theory as explanatory.

The following papers were identified using the search strategy described above.

Total number of retrieved papers	**5***	**4***	**3***	**2***	**1***	**0**
108	18	7	6	10	21	46

Table 16: Theory Five and Six retrieved and graded papers

Of the 18 papers, there were six trials, four qualitative studies, three reviews, three surveys, one conference paper, one design/protocol and one book chapter.

The studies that were not included focussed more on non-working age populations, clinical practice settings and specific clinical conditions. Of the included studies, explicit reference to the mini theories within the overall macro theory of self-determination was only mentioned in the paper by Niven and Markland (2016). Other papers used SDT in a more general way. Overall constructs such

as intrinsic and extrinsic goals and motivations, linked to our perceptions and experiences of competence, relatedness and autonomy were prevalent, but not in detail and not embedded through the studies.

Integrating synthesis findings

The proposed CMOs at the end of Stage One were;

Theory Five: Competition (initially thought to be explained by achievement motivation theory)

> *In a context where people enjoy an active life (C), the Step Count Challenge provides a competition in which people can test their ability (M) to do even more physical activity with each other and against each other (O).*

Theory Six: Peer pressure (initially thought to be explained by self-efficacy theory)

> *In a context where people have been pressurised into joining a team and do not feel confident about physical challenges (C), the Step Count Challenge can make them feel vulnerable to being judged by others (M) resulting in them failing to complete or not enjoy the challenge (O).*

The reviewed data included specific themes about competitiveness and about peer pressure and both data sets helped with refinement of these theories. In addition, there were data about some specific constructs in self-determination theory that helped to refine the theory further. These included: relatedness, autonomy, and self-regulation.

Mechanism of competitiveness

The general concept of competitiveness was found in the data. These data were generally supportive of the context expressed in the CMO but provided the additional dimension of prior physical activity experience. Fadli et al (2018) noted that competition worked for those with high self-esteem and previous physical activity participation. Similarly, Perez-Calhoon (2017) reported that regardless of being on a team or not those that fared better had more of a self-motivated belief.

These data (Fadli et al 2018) (Perez-Calhoon, 2017) added concepts such as high self-efficacy, low anxiety, low affiliation and high achievement to the general background of who physical activity competition is likely to work for. This is important to the personal context of who is offered the Step Count Challenge opportunity and perhaps helps predict how they might respond.

Other data speak to the possibility of polarised competition outcomes in the same context. That is, when individuals with high self-efficacy are either motivated or hindered by their own competitive traits. Fadli, Prestwich, and Sykes-Muskett (2018) note that, "*sometimes the competition may also destroy the motivation itself. This might be due to the personality traits of the people, when they consider themselves as competitive, competition is likely to enhance their motivation, and vice versa*" (p.9).

Bojd, Song, Tan, and Yan (2018), offered similar resources to enable competition to that found in the Step Count Challenge leaderboards that could track personal and team progress. Bojd et al. (2018) noted that leaderboards provided both ranking and progress information and acted as external incentives. Bojd et al. (2018) specifically states that "*social comparison is one of the popular multi-user interactions in gamification designs. Social comparison is an important source of competitive behavior*" (p.5).

In relation to the proposed CMO, the data is generally supportive of the context that individuals who already enjoy being active are likely to respond favourably to the opportunity of the challenge. They

are perhaps likely to sign up for the challenge because of factors such as higher self-efficacy and lower anxiety. However, in refining the CMO based on SDT, it was implicit that those who enjoyed an active life would be more intrinsically motivated and enjoy the test of a competition. On the basis of Bojd et al. (2018) data, the process of participation in the challenge may be more extrinsically motivated based on social comparison. On that basis the outcome could be positive or negative based on the nature of the comparison.

There may then be two separate stages, where the mechanisms may be different: one at the stage of signing up to a challenge and another that may be the process of participation in the challenge. On this basis the following revised CMOs could be further explored in Stage Three.

> *In a context where people already enjoy an active life and feel little anxiety about being active (C), the Step Count Challenge as a competitive opportunity 'piques' their interest (M) and engages them to sign up to the challenge (O).*
>
> *In a context where 'competitive people' have signed up for the Step Count Challenge (C) the visibility of a leaderboard enables social comparison (M) which can lead to both positive and negative experience of the competition.*

Mechanism of peer pressure

The second CMO was based around the idea that peer pressure, as a form of extrinsic motivation, would result in a largely negative outcome via a mechanism based on vulnerability to being judged. Like the data on 'competition' the reviewed data suggest that there are probably two stages within what was previously considered to be a single CMO. The early stage of the challenge and the process of completing and going beyond the challenge.

Podlog and Dionigi (2009) reported that *"once workers choose to become involved in an exercise program, reducing the amount of autonomy to attend (e.g., making exercisers feel guilty or expressing disapproval if they miss a session) may be powerful ways to generate adherence"* (p.784). This suggest that extrinsic motivation in the form of peer pressure can be an effective way to get employees to adhere to an activity programme.

Larson, McFadden, McHugh, Berry, and Rodgers (2017) in their qualitative study of novice exercisers suggests that the motivation can develop into a more intrinsically motivated form. However, Larson et al. (2017) go on to report that few respondents continued to exercise to the same extent following the intervention, suggesting that motivation remained relatively extrinsic/controlled. Larson et al. (2017) was also a longer intervention than the Step Count Challenge and without the leaderboard/visible performance data. It is likely that in a shorter period, and with the added visibility of a leaderboard, motivation may be largely controlled for those who were pressured into joining the Step Count Challenge. However, it suggests that the outcome could be a positive one if the goal were to adhere to the challenge and to generate steps, regardless of the form of motivation. The outcome though is likely to be negative if the goal were to generate sustained physical activity behaviour change.

> *In a context where people have been pressurised into joining a team and do not feel confident about physical challenges (C), the Step Count Challenge can provide a period of sustained controlled motivation through feelings of guilt and shame (M) resulting in adherence to increasing step counting for the duration of the challenge (O)*

In a context where people are adhering to a fixed period of behaviour change under pressure from others (C) the end of that fixed period brings a welcome relief (M) that the behaviour can return to the previous habitual state.

In both CMOs relating to competition and peer pressure, self-determination theory has more to add to the understanding of how the Step Count Challenge could and might be operating through the constructs of relatedness, autonomy, and competence.

Mechanism of relatedness

The qualitative studies of Bojd et al. (2018), Podlog and Dionigi (2009) and Fadli et al. (2018) in particular had more to say about the nature of competition, both for experienced and for novice exercisers. Common to all these studies were competitive experiences described in terms such as fun, friendly, cooperative and social. Podlog and Dionigi (2009) states that "*These friendly intergroup rivalries were perceived to be an important source of social integration and connectedness that motivated participants to continue attending the exercise sessions"* (p.780). Bojd et al. (2018) note, *"that cooperation and competition spirit lead to greater engagement and weight-loss success"*(p.7). Fadli et al. (2018), in reference to walking competitions specifically, notes that *"the use of game-based intervention is effective to improve walking behaviour as it assists people to establish the social competition atmosphere"* (p.2).

Taken together, there is a sense that the type and nature of the competition matters to motivation. Competition which can foster relatedness without undermining competence seems to be an effective tool for workplace challenges. Podlog and Dionigi (2009) state specifically that, *"Findings from this study highlight the importance of an exercise context in which self-presentational concerns do not undermine competency need"* (p.783). Podlog and Dionigi (2009) goes on to state how this may be even more relevant for novice exercisers.

However, some data suggested that the relatedness aspects are just as significant for those who are experienced. Stragier, Abeele, Mechant, and De Marez (2016) in their study of how people use online fitness communities to share physical activity data found *"When we compare novice and experienced users, it appears that people may start using OFCs [online fitness communities] for their data collection and analysis affordances and stay if the social community aspect of the OFC offers them an enjoyable experience. Hence, in order to prevent drop-out, it seems important to create this social experience"* (p.40).

People's needs for relatedness were explored and explained in greater depth by a few studies, in particular, Pedersen, Halvari, and Olafsen (2018) in their study of co-worker support for physical activity found that co-workers were more able to provide this quality of support than mixed groups that included supervisors. Podlog and Dionigi (2009) also found that "*camaraderie and social connectedness through co-worker interactions in nonwork settings, providing emotional support, and assisting one another in performing exercises were key sources of relatedness need fulfilment and exercise adherence*" (p.783).

Although acknowledging that co-workers can have a negative as well as a positive influence (due to their frequent presence), Pedersen et al. (2018) provides evidence of mental health benefits and work-specific outcomes that can result from this co-worker relatedness, and which could be generated within physical activity teamwork. They state that relatedness among co-workers can act as a buffer to work-related stress, intentions to leave employment and to burn out.

The teamwork and social support theory in the previous section perhaps stands here and is explained by the SDT construct of our basic need for relatedness.

In a context where people are often busy or work alone (C), the Step Count Challenge offers an opportunity to form a new team (I) which can lead to feeling more connected to and supportive of each other (M) whilst working together on the shared task of increasing their physical activity (O)

Mechanism of autonomy

Brinkley et al. (2017) suggests how a physical activity challenge may support more autonomous motivation in a workplace context, giving participants options to schedule activity and create the rules for participation. They also found that *"participants [in the challenge] scored highly (mid-point 50) on markers of autonomy such as choice (71.38 v 14.02), internal perceived locus of causality (80.43 v 13.66) and volition (94.6 v 7.37)"* (p.480).

Although no CMO was created in Stage One, there were data that demonstrated how some employees enjoyed a 'local worksite' version of the Step Count Challenge. They mentioned tailoring their walking programme and an intra workplace challenge supported by their own 'home-made' leaderboards. This idea that challenges might allow for local tailoring at the level of the workplace could bring an increased sense of autonomy. The following CMO could be added:

In a context where people are often busy or work alone (C), the Step Count Challenge offers an opportunity to form a new team (I) which can lead to feeling more connected to and supportive of each other (M) whilst working together on the shared task of increasing their physical activity (O)

However, most of the reviewed data focussed on how autonomy was thwarted by personal and work-related constraints. Podlog and Dionigi (2009) and Torquati et al. (2016) explored this and evidenced significant work- and family-related demands that affected individuals' decisions about when and how they could participate in physical activity. However, for some participants Podlog et al (2009) also noted that "*positive family support was vital in facilitating program compliance*" (p.783).

There had been no CMO generated in Stage One relating to broader social and cultural patterns and how they may affect how the Step Count Challenge is able to produce its effects. A few participants in their blogs had noted how enlisting other family members had helped them in the challenge. It seems, on refection, that it may be helpful to consider this, even although it may perhaps be out of scope for detailed refinement in further stages.

In a context where participation is contingent on time away from family and others (C) being able to find ways to 'kill two birds with one stone' and involve others in the intervention (M) can make participation possible (O).

Mechanism of self-regulation

The data extracted in relation to SDT, demonstrated a link between the fulfilment of our basic needs for autonomy and competence and the practice of self-regulation and goal setting. In studies using walking as a specific intervention, the use of pedometers and step counting as a support for self-regulation is evident. As Lutes and Steinbaugh (2010) explain, "*Pedometers may be effective within the Self-determination Theory framework because they allow participants to self-monitor, set relative goals, and increase motivation and enjoyment despite potential walking barriers (such as a non-aesthetic walking environment*"(p.149).

More explicitly related to self-determination, Donnachie et al. (2017) state that "*the majority of men self-monitoring using pedometers and associated goal setting during the programme supported the*

development of autonomous motivation for PA by satisfying basic needs for autonomy, competence and relatedness" (p.12). However, Donnachie et al. (2017) also note that many were only motivated for the period of the challenge itself.

These data support the idea that self-regulation, by counting steps towards a step goal, can assist in building the autonomy, competence and relatedness required for the period of the challenge. It may also enhance motivation during that period, at least for those with a degree of, even external, motivation to participate.

Data from Niven and Markland (2016) explain though that introjected motivation, although sufficient to allow perceptions of competence and relatedness are unlikely to be compatible with feelings of autonomy and this may be a reason why sustained participation is not delivered. This also seems to be supported by Arrogi, Schotte, Bogaerts, Boen, and Seghers (2017) who note that "*there were sustained intervention effects on competence and total need satisfaction in the long-term. Between-group change differences of 0.18 and 0.15 were observed in competence (p = .022; ES = .30) and total need satisfaction (p = .049; ES = .27), respectively. Satisfaction of perceived autonomy and perceived relatedness did not show long-term intervention effects"* (p.13).

Pedersen et al. (2018) notes that the length of interventions is perhaps related to the nature of the outcomes that can be achieved. In their study they found that *"the intervention failed to have an immediate and significant effect on sickness absence 5 months after baseline assessments. We argue that the process of basic needs satisfaction and internalization of autonomous motives for PA requires sufficient time and repeated encounters with a need supportive social environment in order to unfold and stabilize"* (p.8).

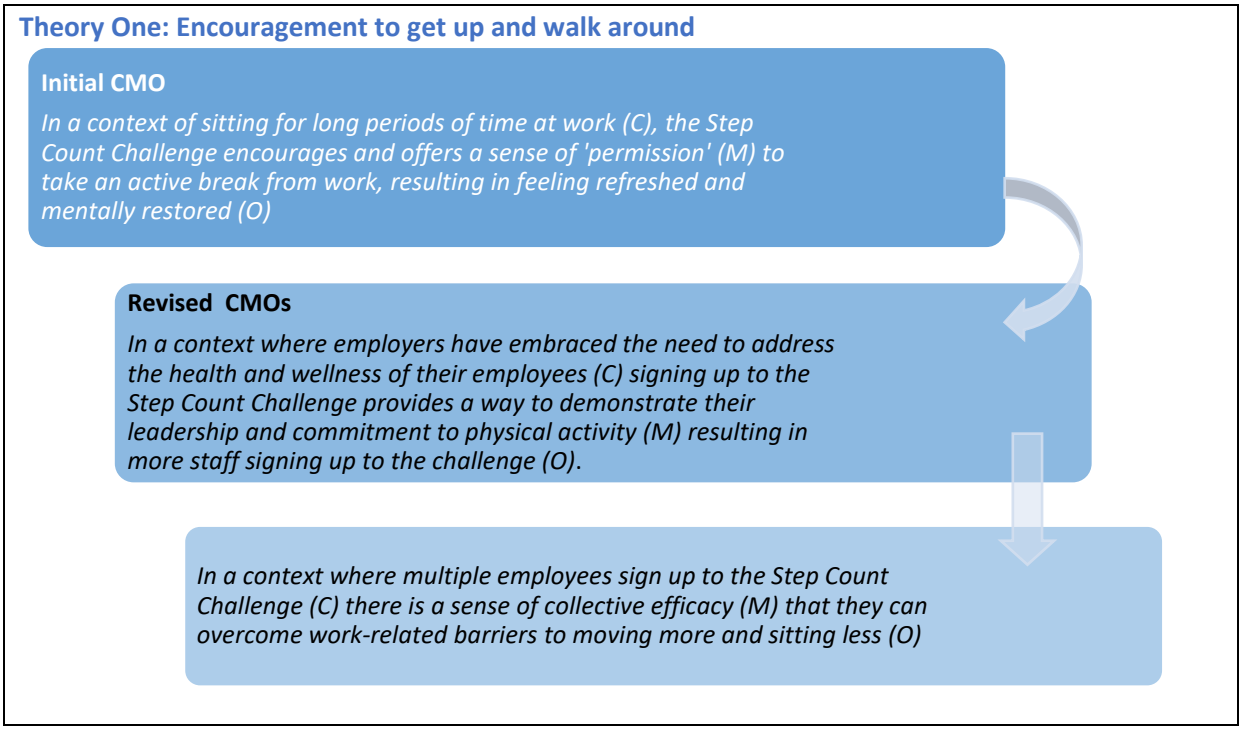
RAMESES 1 Standard 7 – Data extraction. Data extraction assists analysis and synthesis. Of particular interest to the realist reviewer are data that support the use of realist logic to answer the review's question(s) – e.g., data on context, mechanisms, and outcome configurations, demi-regularities, middle-range and/or programme theories. I believe that the work above demonstrates that I have met this standard.

Summary

This section summarises the initial programme theories and the revised programme theories, following the synthesis. I have presented these as a series of diagrams as I appreciate that the synthesis contained a substantive amount of data, and it can be challenging to keep track of revisions when working iteratively between chapters.

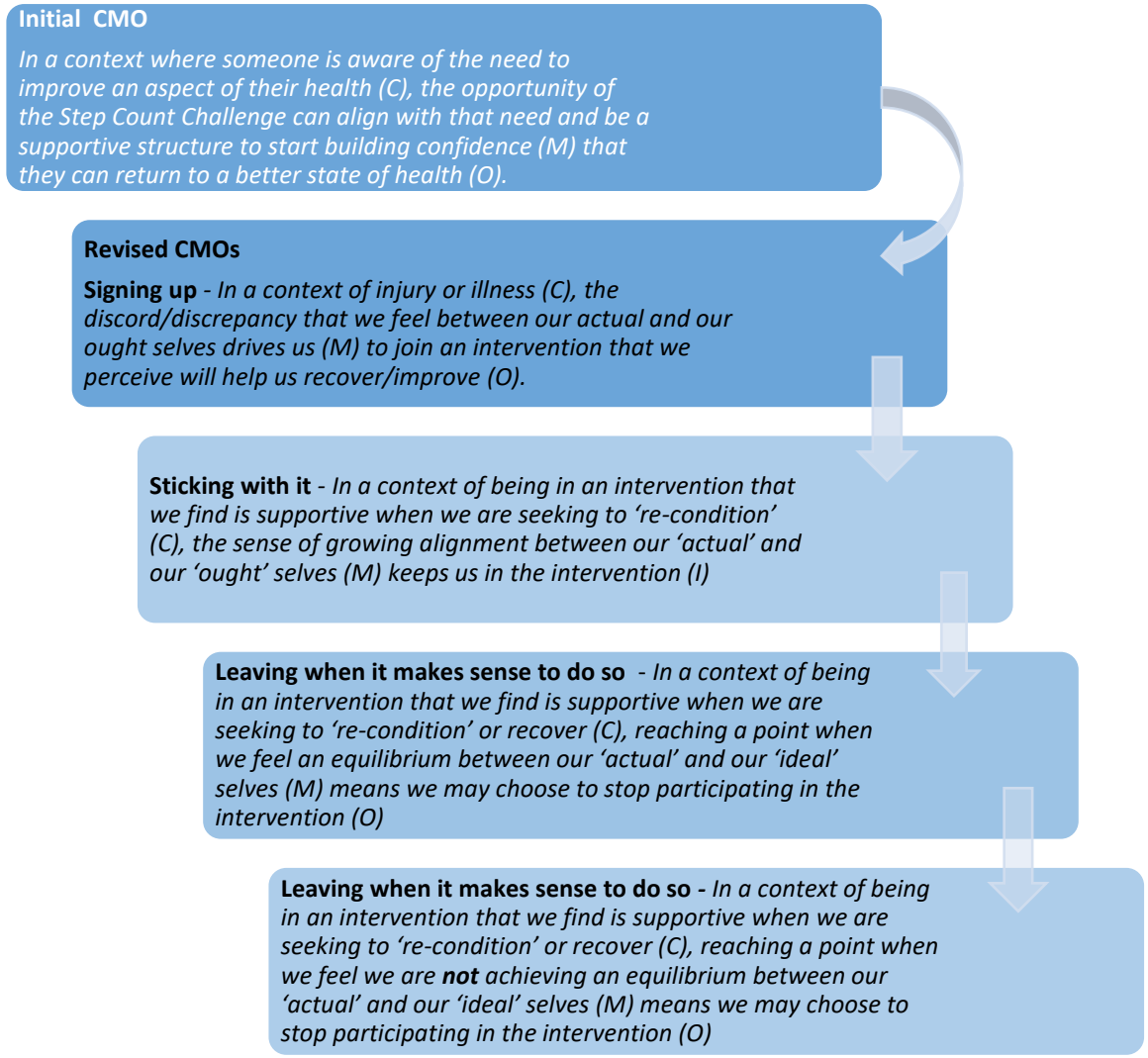
In most cases the initial programme theory was broken down into a range of sub-theories, as the synthesis of published literature had enabled me to be more granular and detailed about the contexts, mechanisms and outcomes. In the case of Theory One and Two the revised theories were related and linked. In Theory Three, multiple concepts and ideas emerged from the synthesis, and I concluded that these theories were still emergent and the relationships were not yet clear enough. In the case of Theories Four, Five and Six, the findings of the synthesis enabled me to be much more precise within the revised theories.

In the following Chapter I test and revise these theories presented below through several case studies in workplaces where staff had participated in the Step Count Challenge.

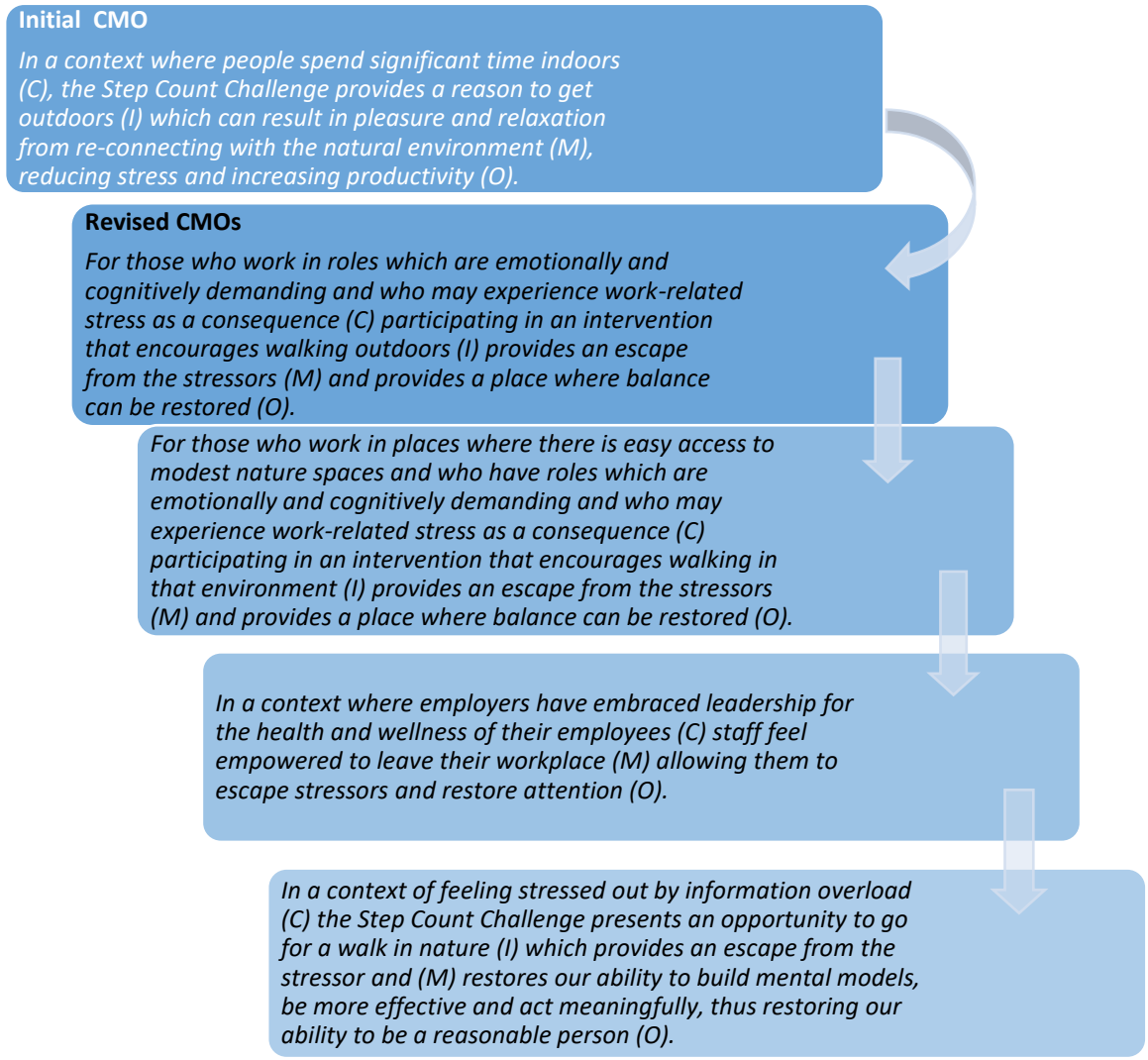


There is a need to explore specific workplace level policy and leadership programme theory additionally to what is set out above. There is ample Stage One data to use from Paths for All that could flesh out a CMO and ground it in their practice.

Theory Two: A Desire to get back to better health



Theory Three: Blowing away the cobwebs



At the end of the synthesis of Theory Three, there was an additional theory to those above that seemed to conflate several of the ideas in the theories above. I decided to leave this theory in a conflated form and explore it further in the next stage where I had a hunch that it could, perhaps, be simplified. In keeping with my desire for transparency and the iterative approach, it is presented below:

> *For those who work in places where there is access to green and blue spaces and who have roles which are emotionally and cognitively demanding and who may experience work-related stress as a consequence (C) participating in an intervention that encourages frequent breaks to walk in that environment (I) provides escape from the stressors of work creating a pause when demands cease and energy is restored (M) which when repeatedly experienced gives an increased sense of self-regulation/control, resulting in higher vigor and dedication, and lower cynicism and professional inadequacy (O).*

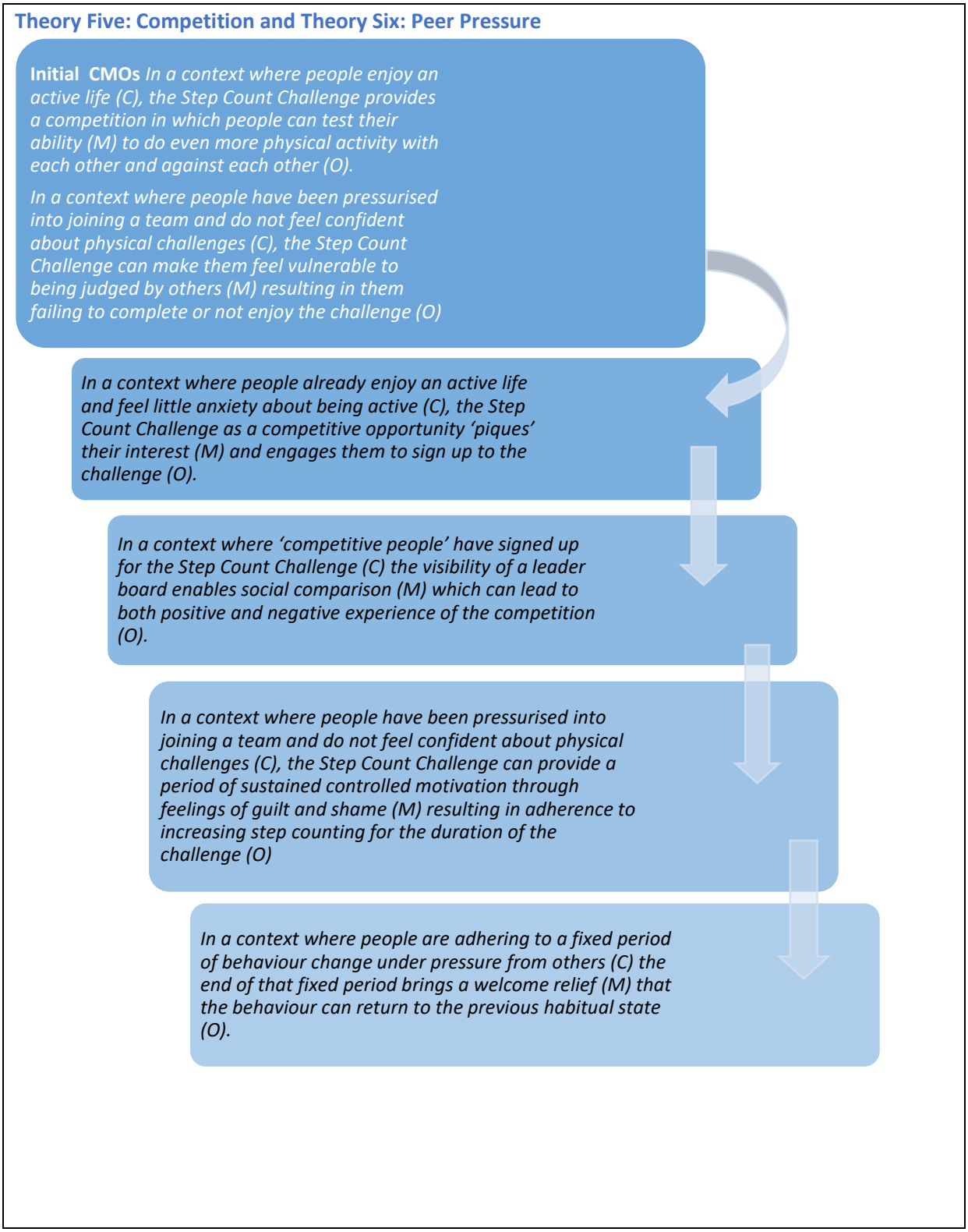
Theory Four: Team-work and support of colleagues

Initial CMO

In a context where people are often busy or work alone (C), the Step Count Challenge offers an opportunity to form a new team (I) which can lead to feeling more connected to and supportive of each other (M) whilst working together on the shared task of increasing their physical activity (O)

Revised CMO

In a context where the performance of the Step Count Challenge team is judged by the aggregated performance of visible individual scores with in the Step Count Challenge team (C) a sense of accountability between team members spurs people on (M) and results in people doing more steps than they may have without the visibility (O).



There were two further theories that arose from the synthesis that broadly related to relational mechanisms. They were not explicitly about competition or peer pressure though and so I have added them here.

> *In a context of national intervention that has flexibility to be locally tailored (C) teams can have fun creating a sense of ownership (M) that gives great enjoyment and a better experience (O)*

In a context where participation is contingent on time away from family and others (C) being able to find ways to 'kill two birds with one stone' and involve others in the intervention (M) can make participation possible (O).

As noted at the start of the summary, the following Chapter tests and refines these theories through case studies of workplaces that have participated in the Step Count Challenge.

Chapter Seven: Refining the theory through testing with case studies

Introduction

In Stage One of this study, I hypothesised how the Step Count Challenge might work and I developed an initial rough programme theory. In Stage Two I refined and revised these theories through a realist synthesis. In Stage Three I tested and further refined and revised these theories through case studies of businesses who participated in several of the Step Count Challenges. Figure 8 provides an illustration of the overall process and the place of Stage Three (shaded in blue) within this.

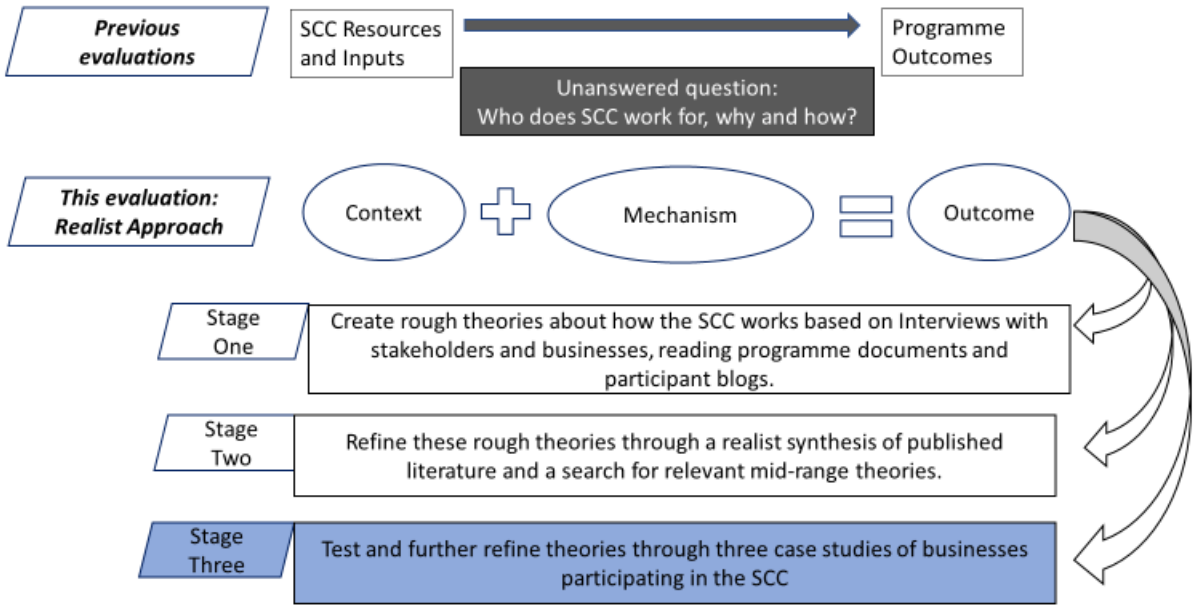


Figure 8: Overall structure of the study showing the place of Stage Three

Aims and objectives

The overall aim of Stage Three was to test and refine the theories from Stage Two. The objectives were to:

I. identify the extent to which the current theories resonate with those who have participated in the Step Count Challenge,
II. understand how these theories operate (where they are resonant) within different types of workplaces,
III. understand how components of the theories interact at different levels within the workplace (for example, leadership and co-worker relations)

A further aim for this stage was to provide enough documentation to illustrate the method.

Method

As described in general in Chapter Four (p29) the approach for Stage Three used case studies to test and refine the theories. Case studies were chosen as an appropriate method to test our theories about how the Step Count Challenge might work in different workplaces. Easton (2010) notes that *"a critical realist case study approach is particularly well-suited to relatively clearly bounded, but*

complex, phenomena such as organisations, inter-organisational relationships or nets of connected organisations" (p123).

Selection of workplaces

The selection of case studies was based on the following criteria:

- The type of work people in the business do - the theories suggest that the Step Count Challenge may be more relevant to those who have cognitively demanding and/or emotionally demanding work. These types of work were a specific item for inclusion.
- The type of company - the theories suggests that leadership is important and so different types of company may experience the challenge differently. To address this, I included different sizes and types of company ownership.
- The background about the company's participation in the challenge – choosing companies with many teams entered and team results that span high and low ranking in the challenge allowed for a diverse recruitment of participants in the case studies.

The final case studies included three companies and their characteristics are set out in Table 17.

Criteria	**Rationale**	**Company B**	**Company E**	**Company F**
Years of participation in Step Count Challenge	To explore leadership over a substantial time period	5 years	3 years	5 years
Number of teams entered	To explore interaction between individuals and teams	11	8	5
Performance of the teams (in 2019)	To explore views from participants were in teams higher and lower on the Step Count Challenge leaderboard	9th to 580th	74th to 568th	7th to 61st
Type of workplace	To explore different work contexts and types of work	Care service provision (commercial)	University (School level)	Factory – global company (production)

Table 17: Characteristics of case study businesses

Selection of case study participants

To ensure I was able to refine the theories based on a rounded understanding of the company participation, I chose to involve three levels of staff:

Senior managers

The senior manager in the company/division who is ultimately accountable for staff health and wellbeing. They were included to explore questions regarding the relevance of the challenge to their company strategy and goals and to test theories regarding employer leadership.

Workplace coordinators

This is the individual who acts as the coordinator for the challenge within the company and who has an overview of multiple teams in the challenge. They were included to give insights into inter-team dynamics within their company and experience of managing issues such as peer pressure and competitiveness (a key aspect of the theory).

Participants in the challenge

Participants were staff who signed up for the spring/summer challenge of 2019. Working with the challenge coordinator (above) I sought to include participants who were in high and low ranked teams (including some participants who may not have completed the challenge). Personal demographics were not explicitly a criterion as the theories I am testing do not show strong alignment with these. However, the theories suggest that male/female experiences could differ and so I sought to ensure a balance of men and women.

Recruitment to the study

The recruitment of the case studies and the participants within case studies was undertaken by me, staff from Paths for All and staff from the workplaces themselves. It was a multi-stage process as described below:

Stage One: Company recruitment

Paths for All approached the Step Count Challenge company coordinator to invite the company to participate as a case study.

This was done via email and included:

- a Case Study Project Information Sheet
- a Case Study Project Consent Form

The Case Study consent form included contact information for me and the Paths for All Manager with an open invite to contact in advance to discuss any aspect of the case study or the wider study.

The email proposed a telephone conversation between me and the company coordinator to discuss what was involved in the case study. The call sought to ensure that the coordinator understood that there were two processes of consent involved (i) consent to be a case study company (ii) consent to be interviewed as part of the case study.

The consent to be a case study forms were collected in advance interviews via email. All other consent forms were gathered at the start of the interview, providing a further opportunity to clarify or discuss any aspect of the research.

Stage Two: Recruitment for the senior manager interview

I discussed with the company coordinator the best way to approach the senior manager to provide project information and informed consent forms. I also discussed the best way to set up the

interview appointment (for example via a PA or directly). Regardless of the specific approach, I ensured that the company coordinator and the manager were provided with information and a range of contact details (myself, Paths for All, and supervisor) should they wish to discuss any aspects of the research.

Stage Three: Recruitment of the participants for the case study workshop

I discussed the proposed recruitment criteria with the company coordinator. Through discussion we determined the best way to approach participants to provide project information and informed consent forms. The timing and location of the workshop was also determined in consultation with the company coordinator. The participant consent forms contained contacts details for me, the Paths for All Manager and the supervisor.

Participants in the study were offered tokens of appreciation for their involvement in the study. These were not advertised in advance of the study and were not intended to act as incentives. Each participant was given a Paths for All tote bag, water bottle and notebook. The senior manager received a formal thank you letter from the researcher and the CEO of Paths for All to thank them for their participation in the study, both personally and as a case study.

Data Collection

Following ethical approval from the University of Edinburgh (Appendix 2: Ethical approval for Stage Three), data were collected in December 2019 and January 2020. Each interview and focus group were audio-recorded and the recording uploaded to the University Data Store. Interviews lasted between 30 minutes and 45 minutes and focussed group discussion between 40 minutes and 60 minutes.

The purpose of the data collection was to test five previously developed theories. The approach was tested initially in a workshop held in June 2019 at the Active Travel Conference Scotland, as a workshop for conference participants. This test demonstrated that sharing the detailed 'realist' theories that had been generated in Stage Two was difficult for participants with no realist method awareness. Based on this experience, an interview schedule was developed which shared simpler statements about how others may have experienced the Step Count Challenge (derived from the theories of Stage Two). Participants were then invited to comment on and discuss on how these related to their experience of the Step Count Challenge. I then probed for further data in relation to refining context, mechanism, and outcomes.

The materials used to guide the focussed group discussion are in Appendix 5.

Coding, analysis, and reporting

This overall study used retroductive reasoning as its main tool for analysis (Justin Jagosh, 2020). This entailed iterations of inductive data-driven and deductive theory-driven analysis to continuously refine and test how and why the Step Count Challenge might work. The evolution of these continuously refined theories was held and tracked in NVivo using an approach described by Forster et al. (2015) and described in Chapter Three.

The data from this phase three were added to this ongoing coding framework described in Table 18.

The Data Coding Framework in NVivo				
Theory 1 (repeated for each theory)	Preliminary data	Stage One Data	Stage Two Data	Stage Three Data

Context Mechanism Outcome	Data providing the origins of the theory from preliminary reading – the Initial Rough Programme Theory. Some CMO structure but many gaps	Data from interviews with stakeholders and participants – coded to develop, delete and refine CMO configurations Initial search for possible mid-range explanations	Data from realist synthesis - coded to test and refine the theorised CMOs from Stage One	Data from Interviews and group discussions to test and refine specific theorised CMOs from Stage Two
Additional data	Data about how this theory might be working - providing and supporting researchers' hunches.			

Table 18: The data coding framework in NVivo

Findings

Theory One – Encouragement to get up and walk around

In Stage One I had theorised that in a context where employees spent much of their day sitting, they may need 'permission' to get up and move, and that the sense of having that permission may act as a mechanism to participate in the Step Count Challenge. Following our realist synthesis, I refined this as a mechanism that operates at the organisational rather than individual level. I then proposed that signing up to the Step Count Challenge as an organisation triggered an act of leadership that demonstrated physically active workplace culture. As an extension of this, it was added that where this overall culture exists in a workplace and where enough employees are signed up to the Step Count Challenge, (context), employees believe they can overcome day to day barriers for themselves.

Given the nature of this theory, case studies enabled me to test the idea of how culture and leadership for physical activity operated in a workplace.

Company B

In this company the senior manager clearly supported the overall theory that the trigger to sign up to the Step Count Challenge is their commitment to a culture of workplace health. This company are signed up to Healthy Working Lives, which is a programme of workplace health improvement, like Investors in People Award, having bronze, silver and gold award levels.

"Strategically, it's very much a part of our Healthy Working Lives Award approach and when you sign up for something like that it really crystallises your whole organisational view of how we are supporting our employees to be healthier. So, for us, having a framework like Healthy Working Lives is really good, isn't it"? (Senior Manager, Company B)

However, this senior leader also emphasised how it takes additional steps to engage managers throughout their large, multi-site business. They explained:

“So [the champion] will do the bottom-up approach and encourage individuals and I'll do the top down and contact managers and say,' come on, have your encouraged your teams enough?' Usually, they have talked about it and know what they are going to do, they just haven't got around to the email part and getting people to sign up.” (Senior Manager Company B)

Despite this senior commitment though, staff in the company who participated in the Step Count Challenge recognised that the nature of the work they do means that ‘visibly walking more’ can be a challenging thing to do “*because a lot of the time the people in the team are spread out across over the country, working away” (Staff, Company B).* Similarly, another employee described, *“when you are delivering [service] it's sometimes quite tight schedules. You don't get a lot of free time in between customers so, apart from the walking you are doing at work, the majority is either before or after work.” (Champion, Company B)*

In this company, despite the senior leadership commitment, it was possible for staff to experience a lack of encouragement. This staff member had taken part in numerous challenges over several years and commented that:

“They don't discourage you, but there's no encouragement. It doesn't happen in work time, so why would they be interested. No one says don't go out for a walk on your lunch or anything like that - everybody has a lunch hour, and you can do what you want in your lunch hour. But they could say 'right let's go for a walk’.” (Staff, Company B)

Company E

The senior manager in Company E also confirmed that they see the sign up of their part of the business to the Step Count Challenge as part of a broader commitment to workplace health, wellbeing, and sustainability:

“I have an audit coming up next week that I put [their part of the business] in for the bronze sustainability award and there’s the health and wellbeing element to that. We put up the posters up around [the business] about take the stairs if you can. So, the step count challenge becomes part of that, it’s my proof that we try to have that balance of healthy, sustainable activity at work.” (Senior Manager, Company E)

This manager also noted that it takes proactive encouragement that goes beyond simply signing up:

“It's about giving encouragement to get out or giving them the idea to get out and about, rather than permission in any way, shape or form. So, 'Yes, let's go and do and oh I could do that.' It's about encouraging people to take a break because we are all very, very bad for sitting at our desks and not taking a lunch and not taking any breaks and what have you, so this is almost, well not enforcing but encouraging people to actually get out and do that.” (Senior Manager, Company E)

Staff in Company E noticed that “*there was a lot of encouragement from [senior manager] to take part”.* Another staff member in the company noted that “[*Senior manager*] *put out that the [company] would support the costs but that, in a way also triggered you to think about oh maybe I should take part. I am not sure I would have even thought about it without the call going out saying we can put teams together; we can do this”.*

Company F

The case study of Company F also indicated the importance of the Healthy Working Lives programme as a broader context for signing up to the Step Count Challenge:

"We have the Healthy Working Lives Team, so we raise stuff like this monthly. We sit down every month and we've got two Directors on board and that's quite handy for authorisation or like payments and stuff. So, this group raised that it was coming up again for the Step Count Challenge and asked if it was alright and we could go ahead and get it done" (Champion, Company F).

As with Company B, the champion indicated that simply signing up is insufficient to engage every team/line manager:

"It depends on what team you are in. There's a few managers and supervisors that are really supportive and you do get one or two that are less, well they might think it's kind of pointless and they just want to produce [widgets] at the end of the day. But that's a minority, the majority are supportive and encourage their staff to participate." (Champion, Company F).

Among the staff in the discussion group there were team leaders who participated in the challenge alongside their staff. However, like company B, staff were not aware that the most senior company managers had any interest in their participation, with one staff member noting "*I don't think they care*". However, the champion at this company noted that during a recent meeting "*the Managing Director, he was actually speaking to one of the Directors today who was at the Healthy Working Lives meeting, and he wants to kind of get more involved. He wants to know what is happening so he can sort of publicise the good things that we are doing more. So, he wants to be notified and publicise it a wee bit".*

What these findings mean for this Theory One

The level of commitment to staff health and wellbeing ranged from a very general commitment to health and wellbeing, with no obvious link to business outcomes, to a serious investment in health and wellbeing for the purpose of managing sickness absence and productivity. In each of these cases, the interest in staff health and wellbeing was part of the context that enabled a leadership response to the opportunity of the Step Count Challenge. In each case the reasoning of the company was related to their need to demonstrate and evidence their commitment to staff health and wellbeing. The outcomes of this context and mechanism were to symbolise the company commitment to staff health through externally validated programme such as Healthy Working Lives.

Although leaders hoped that this process of signing up and being committed to Healthy Working Lives encouraged staff to participate in the challenge, it is likely that other contexts and mechanisms offer a better explanation for this.

Theory Two – A desire to get back to better health

In Stage One I generated a theory that the Step Count Challenge could provide a supportive structure for those already aware of a health issue or illness, through which they could build confidence that they could return to a better state of health. In Stage Two I refined this theory through a realist synthesis. The refinements identified that the sense of discordance or discrepancy that people felt between their poor state of health and the health that they would like to have, generated a need for change and improvement towards a better state of health. I theorised that it was the need to end the discordance and restore better health which triggered their motivation to sign up to the opportunity of the Step Count Challenge.

In this final testing stage, I tested these theories in the context of the different companies.

Company B

In company B I found that this mechanism was experienced by those who had a significant health gap between where they are and where they want to be. This staff member describes her significant weight loss journey:

"when I first started doing the Step Count Challenge, I had just started losing weight - I think the first year. And that was the first time I wanted to participate in the Step Count Challenge because I thought it would aid, because walking was what I was using as my exercise. My goal was to lose, like 10 stone, so and that really helped with that. And I couldn't stop walking after that so, and I lost the weight that I wanted to lose and that was my goal. Em and I've not stopped since then so, it's been nearly three years now, I think." (Staff, Company B)

This theory of aligning towards better health also seemed to remain relevant to some participants in this company across a few years of challenges. This respondent described how she used the Step Count Challenge to return to exercise following her treatment for breast cancer:

"The very first one I did, so I was treated for breast cancer in 2013 and then 2015 was the first one that we did take part in and that was definitely the 'I need to try this to get back'. I remember showing you that my daily step was like six and a half thousand and now we are like, over thirty and I can't believe the difference. Every one [of the Step Count Challenges] we take part in is more and more and more. But initially the goal was just to try and get back and do it." (Staff, Company B)

Interestingly, the senior manager and the champion in this company were both proactive in using the Step Count Challenge specifically to support staff with poor health. The senior manager noted:

"The reason for it [planning for employee health and wellbeing] is first and foremost to make sure we have employees who are not off sick, who enjoy their work and who feel well at work, you know first and foremost it's about being a good business offering a good service, but then we also have aspects of our work where you know our employees might need a little bit of extra support". (Senior Manager, Company B)

The champion also commented that "*we don't want the super fit to take part, we want the people who are moderately or less fit to take part".* He also acknowledged that this was a challenge to deliver, but nonetheless that was their aim, and the evidence of the staff supported their efforts to deliver this.

The senior manager also noticed a more general increase in motivation and confidence at work, among those staff who had previously had poor health and low levels of activity:

*"We have a few examples of people who were very unfit, ehm, never done any physical activity in their adult life really, taking part and assuming they would fail, and they've stuck with it. And then they've joined the next year and then when you speak to them, they might also have joined the gym. So, it can really help. If they are motivated in general then they'll come to the workplace more motivated and more confident, so ... [*Interviewer*, "you've seen that?"] … definitely."*

It was clear that Company B, as a commercial service provider, used the Step Count Challenge as part of a broader health strategy to address poor health and improve their business outcomes.

Company E

In Company E the senior manager described how they take a more general health promotion-type approach to employee health and wellbeing. She commented that:

"It's probably more about promoting healthy wellbeing in general. So, what other activities or what more support could the [company] give to other types of wellbeing. You know the Step Count Challenge might not be for everybody, so what else could we put on. So, I had originally been thinking about, for my team, maybe trying to test out, you know get a mobile masseuse" (Senior Manager, Company E)

However, although this general health promotion was their goal, this senior manager had also encountered interest from someone who wanted to get back to better health following illness. The manager described how:

"We did have one staff member who had been off work on long term sick and had suffered a stroke. When he was doing a phased return to work, he asked if he could join as well. It was like, absolutely you can. So, it goes really from one extreme to another. You've got people who do triathlons taking part and you've got people who are trying to get back their mobility".

However, despite this one example, the manager made repeated references from to "*trying to break the cycle of sitting*", "*encouraging people to get away from their desks*" and "*people having a more healthy balance*". It therefore seemed that their focus was on small shifts in the balance of sitting and moving time at work, rather than significant health gains for the least active.

As with the intent of the manager in this company, staff seemed to be more focussed on improving a balance of sitting and walking at work. One commented *"we are all very aware of these things and the way that work works, we are sitting a lot. It's [the Step Count Challenge] helped about being very conscientious because we are sitting a lot and we should be doing lots of walking." (Staff, Company E)*

In Company E, staff did report that their modest health discrepancies provided some motivation to sign up for the Step Count Challenge. However, their health needs seem to have been modest and met within the period of the Challenge. It was notable that their health behaviour reverted quite quickly following the end of the challenge.

"I definitely wanted to lose a little bit of weight and get fitter. And I did lose a bit of weight. But I've put it all back on again. I didn't have any motivation". (Staff member, Company E)

Indeed, the manager noted that at the end of the Step Count Challenge there was no ongoing efforts to continue the activity. She noted *"It's [the Step Count Challenge] just gone, do you know what I mean. It just fizzles away until the next time." (Senior Manager, Company E).*

Company F

In Company F the Step Count Challenge also seemed to be more about general workplace health promotion as part of a Healthy Working Lives portfolio. The workplace champion said he did not know about whether staff joined for health reasons, it was more just about offering it and seeing who wanted to join in. There was no link to broader business strategy to improve sickness absence but rather more of a general menu of healthy staff activities.

Like Company E, one person in Company F commented that:

"I wanted to lose a wee bit weight before Christmas. I lost a stone over the course of it. I was watching what I was eating as well [gap] but I've put it all back on again". (Staff Member Company F).

No one else in Company F commented on any specific health motivation for joining the Step Count Challenge, with most in this company noting that they joined in for the fun and competition.

What these findings mean for Theory Two

Staff across all case studies reported that the opportunity to participate in the Step Count Challenge was relevant in the context of their need to address an issue with their health. The scale/severity of their health issue seemed relevant to level of engagement they had with the Step Count Challenge. For example, the person seeking to lose 10 stone and the person returning to work after cancer seemed to have a greater intensity and duration of engagement than the people who hoped to lose a few pounds. The staff with the greater health needs reported a longer-term engagement with the Step Count Challenge (and walking more broadly) across several years, whereas those with modest health reasons for engagement largely returned to previous behaviours (and regained weight) within a short space of time.

Theory Three – Blowing away the cobwebs

In Stage One I generated the theory that where people spend lots of time indoors at work, getting outdoors to walk during the Step Count Challenge could provide an opportunity to connect with nature and reduce stress. The Attention Restoration Theory (S. Kaplan, 1995) provided some validation that this theory was plausible. I had also theorised from data that having 'permission' to go out from work was an important part of the organisational context that would enable this mechanism to work.

In the synthesis in Stage Two I had further refined the theory to clarify that it may work best for those with emotionally or cognitively demanding roles. The outcomes were also further refined through the synthesis and pointed to more specific outcomes related to having time free from work stress to create better mental maps and increase the likelihood of behaving more reasonably.

Company B

In this company the senior manager made a very explicit and strong link between being active outdoors and managing stress. She spoke very personally about the way in which she used her own physical activity to help manage her work-related stresses and how the Step Count Challenge was one way to help support her staff to do the same.

"I've always exercised and it's my way of dealing with the demands of my role and I've always done it. So, I'm really comfortable at promoting that ethos in the organisation. When I first joined the organisation, people thought I just did it to keep fit, but no, it's just a by-product. It's just great to go out of your workplace after a really full-on day and go outside and do some exercise and then I go to bed and I sleep".

The senior manager in this company also went further than role modelling and encouragement. She talked about how it was company practice to proactively seek out physical activity, such as the Step Count Challenge, to support staff to develop coping strategies for stress.

"We look at, you know, how we can support people to be stronger within themselves. Quite often that comes down to how do you build a good set of coping mechanisms and a big healthy part of that is definitely how do you become more active, deal with the stresses and anxieties that you have in a type of role like that."

The manager also explicitly acknowledged the emotionally demanding nature of their work and therefore the need to find ways to support people.

In this company they also noted the link between stress reduction and their proximity to greenspace and its ability to provide the experience of 'getting away' from work. The champion organises some group walks and noticed that:

"Sometimes we walk the other way and go down into the centre of [their town], but that's not as relaxed - it's a bit more stressful with the all the people and the traffic so the canal is a much better environment to walk. Somewhere that's less populated and more wildlife and different smells and noises and so yeh." (Champion, Company B)

For staff at Company B the commute to work by walking outdoors during the Step Count Challenge provided an important space to think. Here is how one employee, who commutes daily because of the Step Count Challenge, described it:

"I've just realised lately that I enjoy walking on my own, more than I enjoy walking with anyone else. I think if I didn't walk here in the morning, I don't know what kind of mood I'd be in. I get very disappointed if I have to go on a treadmill. I hate walking inside now. and yet when I started losing weight it was all about the treadmill. But being outside is everything. I didn't know [their town] until I started walking and I'd been here for a long time. It keeps me sane. I mean I know I am annoying, but I'd be even more annoying if I didn't walk." (Staff, Company B)

The reference to their outdoor walking commute being part of being 'a less annoying person' was also described in similar terms by another employee at this company:

"That's why I like to leave early - I'm awake when I get here, and I also feel good about myself. I feel like I am a good person. I get that little bit of peace before the chaos starts and people interrupt you constantly. I think it does help you work. It does help". (Staff, Company B)

The individual also highlights the contrast in pace and peace between the work environment and their walk. This sense of having more and better time and space when walking to work, was also contrasted with driving to work.

"The length of time you put in if you are walking to work that gives you an awful long time to organise your head whereas if you are like, getting in the car and driving and then doing other shorter walks, you're here and you're like (makes noise). Whereas you've had all that time and you've had a nice slow start. (Staff, Company B)

These staff were in high volume, customer facing roles which were emotionally demanding.

Company E

In company E managers recognise the value of 'getting out' of the workplace and they acknowledge that they need to provide some leadership to encourage staff to do more of this. In this company staff are all office based and work almost entirely on their own computers and in meetings. Their day is almost entirely sedentary with no work-related reasons for getting up and walking around. It is cognitively demanding work. The manager also noted the impact on productivity when this time out is not taken.

"I think people find a real benefit from getting a bit of headspace, a bit of breathing space, you know. But you get to a point where people say, oh I couldn't possibly take time away from my desk because I don't have the time. And actually, I think you become less productive." (Senior Manager, Company E)

Staff here, like in Company B, noted the value of walking to work as affording them time to think:

"I think it's quite nice to be outside and get your head together before you've, you know got to work. Just a bit of headspace" (Staff, Company E)

They also noted the added value of walking outdoors, in the park that is close-by their offices:

"it's more attractive to go out and walk around the trees than it would be to walk twice around a block of flats" (Staff, Company E)

Company F

Given the factory shift patterns (12hrs day/night) and out of town location of company F, it is perhaps not surprising that commuting to work by walking and walking outdoors at work was not a feature of management's approach to the Step Count Challenge. Although staff walked many steps on the factory floor, staff regarded that as 'taken for granted'. Most of the Step Count Challenge (additional) walking in this company was done by staff from their home after work and on days off.

In that context, staff noted the value of walking outdoors. This staff member was a regular gym user who switched to walking outdoors for the period of the challenge.

"I got told off for doing the tread mill. I loved it (walking outdoors). I found places in [their town] that I'd never been in my life. I was up the reservoir. I'd never seen that before. It's quite nice after work if you are on your own for an hour and a half. Just put your headphones on or whatever. You never get that time to yourself if you have families and stuff. I quite enjoy it. I benefit health wise I think." (Staff, Company F)

Another staff member noted the value of 'getting away' from family and other distractions.

"- yeh at night, I might walk two miles to the end of the town and back like. It's an hour and a half on your own quiet, or with your music, or whatever. That's like meditation time that you never usually give yourself. If you're in the house, there's always distractions and stuff and at work you walk to places that you really need to go to" (Staff, Company F)

What these findings mean for Theory Three

It was clear across all case studies that participating in the Step Count Challenge means that participants need to find times, spaces and places to walk. It was also clear that the Step Count Challenge is the incentive to find these places and spaces in their usually busy work and family lives. In making space for the Step Count Challenge, in this context of having busy lives, it was clear that this can generate outcomes that lie along a continuum from adding to participants' stress to offering significant head space. In some cases, it was reported that the headspace made them feel like a better person at work.

Theory Four – Teamwork and support of colleagues

In Stage One I identified that that the Step Count Challenge provided an opportunity to build a team and that team building afforded staff the chance to bond with each other. In the synthesis, I found that it was perhaps the accountability to each other within the team, in a context of personal performance being visible to all in the team, that acted as the mechanism.

In this stage I found considerable overlaps and interactions between this theory and that of theory five, which has a focus on the dynamic of competition and peer pressure. Here I attempt to separate the findings in relation to each theory and in the discussion, I will address the overlaps.

Company B

The senior manager in the company emphasised the value of the team approach to the challenge, particularly given the nature of their business. She also gave a sense that it is valuable to the company to use the Step Count Challenge to 'force' some social connection between staff:

"Given the nature of our jobs. There's not many teams where people live and work in the same area so they wouldn't have a reason to socialise out with the work or during the working hours. So, it's definitely promoted a greater sense of social connection across the organisation in those teams - 'cos it's forced them to spend time together, whereas they could be ships passing in the night." (Senior Manager, Company B)

More specifically, the same manager points to a sense of accountability that team members feel and as with some of the other theories, she describes how this sense of accountability can act to motivate staff over several challenges and across years:

"So there is a real sense of people feeling because it's that team effort that you're too embarrassed to let everyone down, that you keep going because you don't want to drop out and also then you realise that all the benefits of being part of a team are the social aspect of it, you know the joint effort, the collective has come through. So even in things like the names of the teams start to tell you how much fun people are having with this - we've had brilliant ones this year, and great stories of people really upping their game as well. They get a little bit where they did it one year and they did quite well and you see them coming back the next year saying we're gonna bat it out the ballpark this year" (Senior Manager, Company B)

Staff in this company talked less specifically about the sense of team accountability and more about the social aspects of being in a Step Count Challenge team. They also referred to the way they used internal communications in their workplace to enhance the Step Count Challenge team experience.

"But we've used Yammer a lot this challenge and the one in the spring. It's been really good ... just sharing photos and you know we are not all pals on Facebook, so Yammer has been really ... sharing music, sharing stories, sharing photos of yourself in the rain, yeh. A think that's made it feel like more of a group than the first two we did together, when we didn't have Yammer. The bit on the Step Count Website isn't great - the chat bit. It's very, very basic. Yammer is really fun, it's just like Facebook". (Staff, Company B)

Another staff member speaks of how these social aspects deliver stronger work relationships:

"I've got more of a relationship than I had. Yeh, It's understanding say, like [names staff], I would never have known about her triathlon and she then spoke it about it after, like when she was doing it - you get little insights into people's lives. It humanises Directors (group laughter). No seriously it does. People who are maybe an authority figure, maybe even if you never talk about anything else, it's always something to talk to them about when you bump into them in the kitchen and stuff like that. There's a connection that you never had before". (Staff, Company B)

A further staff member in this company described the Step Count Challenge as a social event, akin to other work-related social events.

"It's more a kinda bonding thing for us. The thing is about here, I've only been here about a year and a half, anywhere else I've worked we've always had kind of like social events, but we don't dae a lot of that within here. So, it's a wee kind of social event that we can kind of, you know, something else to talk about and chat about rather than it be a competitive thing." (Staff, Company B)

It was interesting that this social focus came through from staff regardless of where their team was on the final leader board and seemed to sit alongside the dynamics of the approach to team competition. We will explore this further in the discussion.

Company E

In company E, the senior manager noted the social aspect of the challenge but did not connect this to the outcomes or needs for their business in terms of productivity, but rather of breaking the monotony of the work they do. She described participation in the Step Count Challenge:

"It's a bit of having something other than work to talk about but with your work colleagues. So how have you done, have you logged your steps, what did you do at the weekend. Oh, I went out at the weekend cycling 40 miles. Having something to talk about with your work colleagues that isn't work-related, it breaks the monotony" (Senior Manager, Company E)

Staff in this company also acknowledged that when they were physically working in the same space, the Step Count Challenge delivered exactly as the senior manager described:

"If I can go back to the first couple of times, the team tended to be within the room, the same area that we were sitting in and there could be chat about it and lots of laughter around the different things, wasn't there? And that helped with the sense of 'you keep going'. The time I did it with the team where people were kind of scattered around, I didn't feel nearly as connected to the whole challenge - I didn't care as much, if I can out it as bluntly as that. There wasn't as much accountability or there wasn't that team sense of having a social or a fun time." (Staff, Company E)

It should be noted that these staff worked in a series of small, shared offices. In contrast to Company B, this company did not describe any enhanced staff communications activity to support their team, other than meeting face-to-face.

"There's something about when we did it the first time, we were all in the same area as well, weren't we, and we could chat about it. Now we have moved away, and I felt less motivated and involved because I wasn't seeing people that were in my team". (Staff, Company E)

Despite this physical lack of connection, one staff member did point to the sense of accountability and the motivation that came from not wanting to let the team down.

"Yes, I felt that was really pushing me, in addition to the individual challenge, knowing that your team were doing well or that your team leader needed you to pick up, like you would do a bit more in order to help your team. There was definitely something motivational there" (Staff, Company E)

Company F

The senior manager in Company F did not comment on the social side of the challenge and asked that we address that question directly to the staff themselves, suggesting perhaps that they did not as a company see the development of the social aspect as part of the company role.

From a staff perspective, this staff member summed up the social approach very comprehensively:

"It was definitely social. Especially social media. It was very easy to communicate. The team I was involved in created a WhatsApp group, for example. So, there was just competition, good competition. Not even within the team, with other teams right through. For example, people would text you on a Friday night, when you would never, ever see anybody out walking, showing you photos of where they were etc. The motivation was there on the social aspects. I would never go out

walking for as far or as long. I would get fit other ways. So definitely in terms of the social side. I thought it was good from my side, the banter in the office." (Staff Company F)

As with Company B, the staff in this company had invested time to create additional communication channels – in this case, a WhatsApp group. It was also clear that this communication went beyond just the individual team and worked across teams too.

In a further part of the discussion, staff at this company described how they used these social media channels in real time to reach out to team members. They commented that "*Well Jackie was out sending us picture of walking from X to Y and back on Friday night and we were messaging her to get home" (Staff, Company F).* The group described how they felt they were looking out for this person and how more broadly *"it was very easy to communicate. It was definitely social" (Staff, Company F).*

What these findings mean for Theory Four

In all companies, the Step Count Challenge was a significant opportunity to create a new team with work colleagues. In a context where it was reported that work can be mundane or predictable, the opportunity to be in a new team was regarded as fun. Participants responded to this opportunity with enhanced communications, creating new social media channels to enable greater sharing of stories and images about their participation within the Step Count Challenge. The visibility of their activity through their enhanced communication, as well as the Step Count Challenge leader-board, in tandem with their bond to the team, acted as a prompt to do more steps.

The physical connections between staff when walking was almost entirely absent, with almost no staff reporting that they walked together at or during work. Where group walks at work happened, it appeared to be more of a one-off event and of less significance to participants than the day-to-day sharing through social media.

Likewise, the resources of the Step Count Challenge that supports team interaction were not generally used or highly rated. Staff seemed to prefer to use mainstream social media such as What'sApp and company intranets such as Yammer. This ownership and personalisation were part of the fun and staff noted the reduction in motivation when one person who had driven the team connections had dropped out from one year to the next.

Theory Five/Six – Competition and Peer Pressure

In Stage One I had developed a few theories about the role of the Step Count Challenge leaderboard and the challenge format and the effects of peer pressure to participate in the challenge. Through the synthesis, these were refined into a series of realist theories that covered a range of ways in which the Step Count Challenge might deliver positive and negative outcomes in response to the intensity of competitive behaviours and behaviours intended to support participation.

Company B

Company B had teams that varied significantly in their final step count. The scores placed their teams in the top 10 as well as the bottom 100 of the Step Count Challenge overall. The senior manager in Company B described a culture where participation in the Step Count Challenge was characterised by sociable fun, more than serious competition:

"There's a recognition that just taking part is such a great thing to do and that regardless of how many steps you do, it's a nice thing to have taken part in. So, there is healthy competition and there's a bit of joking goes on across the organisation but very light-hearted and good banter and almost to

create a sense of connection as opposed to competition. So, a sort of shared purpose" (Senior Manager, Company B)

This varied from the description of the Step Count Challenge champion who explained that it could be challenging to manage the effects of competition on the motivation of participants, and he had had to find a way to address this. He describes how they did this and why:

"it's not just taking part - they want to win and that's what motivates them. And sometimes that's got a negative for me because we've got one team that's particularly strong, they win every year and that itself can be demotivating to the other teams because they know they won't win, because we have a prize, they know they won't win that prize, because they know they could never beat that team ... you know, unless they are doing marathons every weekend. So that was a bit of a challenge, so what we did this year is we had two prizes, we have a trophy that the winning team gets and they got a pair of happy socks and then all the other teams that completed it were put in a raffle for a free prize draw for a £25 per person gift voucher, so everybody got the same chance to win and that went down well" (Champion)

They went on to explain how the competition can be both helpful and unhelpful depending on how close the scores are:

It [the leader-board and visibility of steps] can also motivate you if you are quite close, because you can do that extra little bit. It's when the difference gets too much, then it could put people off. (Champion)

From a staff perspective, one person described how the challenge provides a competition that is accessible to people, unlike some other sports activities:

"One of the things about walking is that everybody can do it. Okay you can argue with any sport that the better kit you get, like a really good pair of trainers is gonna make it a lot easier but walking, you know you can go at your own pace and it's not, I mean it's cheap, it's not like cycling and running and stuff like that. I'm competitive but I can't compete in running, I can't compete in cycling. You know, so it's something that everybody can do". (Staff, Company B)

However, for this same staff member, being accessible does not equate to being non-competitive. She described how seriously she takes the challenge, being willing to drop people from her team from year to year in order to be pushed harder:

"You drop them. [...gap ...} I needed people who were more competitive because that pushes me more as well. Like it is a challenge and if you've got half a team who aren't wanting to be challenged, then what was the point for me. [...gap...} people in your team challenge you and then that team together challenges the overall teams. It is quite serious; you know what I mean. It's not like life or death but if you want to do a challenge then you want to do a challenge. You know walking saved my life, you know I mean, so it is serious for me. If I hadn't done the walking, who knows where I'd be." (Staff, Company B)

Another staff member describes how from one Step Count Challenge to the next can be an opportunity to get more and more steps, demonstrating their interpretation of the step count 'challenge'

"It gets addictive, it definitely gets addictive, like more and more and more. The more you get the more you want. It's the best addiction I've had." (Staff, Company B)

However, within the Company B staff from another team describe a less intensely challenging process and one based more on a social and softer encouragement to do more:

"My team is no as hard as them. It's our work team so we kinda stick to that team so we don't replace non-performers. I think it is just about that kinda comin' in and havin' a bit of banter. It kinda pushes them a wee bit to dae a bit more but no to the extent we would kick them out the team." (Staff, Company B)

Company E

In Company E, the senior manager acknowledged that there can be quite a lot of competition and how, especially if you are unable to do a high number of steps, there can be a feeling of pressure and a sense of letting the team down.

"There can be quite a lot of competition. I think when my staff started on the phased return he said, 'would it be okay' and I said it's not about that, it's about taking part. So, there can be, and for myself who suffers with arthritis, you can think oh but I'm letting the team down, or I can't do as many as that, so there is, there can be a little bit of pressure actually. So, I think you need to be in a grouping that you are comfortable with, where you don't have to explain yourself or feel like you're letting the side down or anything like that." (Senior manager, Company E)

One of the staff in this company also experienced pressure but in a more positive way, in that it served to push her to do a bit more, even if she was never going to do the same as the person who had a higher number of steps. The sense of being a bit closer seemed important. This is how she described it:

"A bit of team pressure though does motivate you. I think", "Yes, when you see the leaderboard, for example, you know and so. Because one of our team members is doing an awful lot. She is doing these spinning classes and so on and she's got heaven knows how many steps. There's no way I can ever get there but when you are swimming you think 'just do an extra length' (lots of laughter).", "Yes, because you want to be able to put something in that's close to one or two other members of the team even if it's not the person that's way at the top". (Staff, Company E)

However, as with Company B, staff can get very competitive. This staff member describes how she became very competitive with herself and how this was both positive and negative:

*"I probably got overly competitive with myself because I found myself doing crazy things like walking around the park at 11 o clock at night because I had no time during the rest of the day (lots of laughs). And I thought am I getting health benefits? I'm not sure this is very safe behaviour. It did start to stress me out a bit I have to say. The second time I got my head around it a bit more bit the third time I just thought 'I can't let myself down - I must meet my challenge'. And I am so competitive because if I had a day when there hadn't been time to go out at lunch or there hadn't been time to walk home I would think 'oh I am six thousand steps down and it's 10.30 at night how am I gonna make that up'" (*Staff, Company E).

Company F

In Company F, the champion described how updating a workplace leader board on the factory wall provided a focal point for competition between the teams in their workplace:

"I created a wee leaderboard with all the teams and I would update it every 3 or 4 days. I'd usually update it when my team was winning. I'd update it every 3 or 4 days and shove it up in the main

notice board in the corridor. Most folk read that notice board. Especially the folk that were taking part, who'd be up looking at it all the time" (Champion, Company F)

This workplace inter-team competition was clearly the focus of the challenge in this company. This staff member illustrates how that daily comparison between teams resulted in teams putting in efforts to stay ahead:

*"It's part of being in the team, a wasnae doin' 5 or 10k runs every night but I'd check the leaderboard the next mornin' and see oh naw, John's just climbed 30 thousand steps away from me. So that night I'd go out and walk three mile. But then the worst part is you'd come in the day and check the Board and Dave's team or whoever is about 20 thousand steps ahead of your team and you need to get another 2 thousand each an' we could close them in two days. So aye it was good competition. It was good being able to see the visibility of everybody else's competitions" (*Staff, Company F)

As in the other case studies though, there was evidence that the competitiveness led to behaviour that was challenging to sustain and had some negative aspects.

"A certainly think there were a few of us that were ... well, I was startin' tae get grief fae ma wife 'cos I was out at half eleven on a Saturday night tryin' tae get steps in and stuff like that". (Staff, Company F)

Another staff member described how the stakes in the challenge became high enough between their workplace teams that trust began to be an issue. He describes how staff started posting evidence about the number of steps they had done because the numbers were so great, they were being challenged:

"and people started posting images from their actual Apple product or whatever and a sort of here's what we've done and here's the verification. That's where it grew from photos and what did you see on your walk tonight to evidence" (Staff, Company F)

What these findings mean for Theory Five and Theory Six

The role of the 'challenge' element in the Step Count Challenge was complex and multi-faceted. Although 'competition' was present in all companies, it was experienced differently. The difference in the experience seems to lie in the focus of who participants were competing with and the visibility of step counts to yourself, your team and other companies can act as a resource to facilitate this variety of competitions.

For some with a strong personal goal, the Step Count Challenge can be experienced as a personal challenge with the motivation coming from a growing sense of capability and growing steps over the period of the Step Count Challenge. For others, the experience is within their own team and the motivation to step more is to avoid feeling shame of being the lowest step count in the team. Others experience the challenge as an inter-team competition in their company. The daily jostle to be and to stay 'the winning team' in their company provides a constant source of engagement that spurs participants to do more steps.

Some participants start the Step Count Challenge with experience of previous Step Count Challenges, and they are aware of what it would take to win the overall challenge. In a context where they have previously been in the top 100, for example, they may start the challenge with targets such as run 10k everyday or commute 7 miles each way to work. For these participants, the Step Count Challenge can be a serious and all-consuming endeavour and they select teams who will commit to the challenge. Their outcome is to rank highly in the overall leaderboard.

Concluding the individual theories

I am presenting conclusions about the individual theories at this point in the thesis to demonstrate where I have got to at the end of the Stage Three. As explained in Chapter Three, realist analysis is an iterative process that uses retroduction to arrive at its conclusions. These conclusions therefore are not the final word. They are the point at which I am drawing a line based on the data and findings that I have generated at this point in this PhD.

Theory One – Encouragement to get up and walk around

Overview

I tested the theory that Senior, or Company leadership is important to employees who sign up and this was rejected in Stage Three. Staff saw the Step Count Challenge as a discretionary activity done largely in their own time and supported by their colleagues in the team, rather than their managers. Staff felt that their employers played no role in their personal decision to participate in the challenge and walking 'at' work was rarely part of the way in which they generated additional steps.

Although senior managers believe that signing up to the challenge encourages staff to participate, the outcomes which they sought most was to be seen to be a good employer for the purposes of documenting workplace health and safety, and for providing evidence to their Boards and external scrutiny partners. It therefore seems that there is a mechanism at play which is to do with Social Cognitive Theory (Bandura, 2004) (including specifically social learning theory (Bandura, 1977)). However rather than a senior manager to employee influence, it seems to be a company-to-company influence and one that companies will perceive will be rewarded.

Companies signing up to the challenge is therefore insufficient to encourage employees to participate. Senior managers sign up their companies at the organisational level because they see other companies doing so and they want their company to be seen in a positive light. Gathering sustained evidence of this kind of health promotion activity results in awards and recognition for the company. In the specific case of the Step Count Challenge, 'Healthy Working Lives Awards' and 'Investors in People' were mentioned specifically.

The act of signing up from an employee perspective is autonomous and they do not feel the need to have employer 'permission'. Volition is one of the reasons why interventions such as the Step Count Challenge are complex. Regardless of the type of intervention, the intended beneficiaries of most social programmes have a choice about whether and how they will engage (Ray Pawson, 2013). In speaking to employees in the Step Count Challenge it was clear that their decision to sign up (or not) is discretionary.

Final theory

The revised final theory is therefore:

> In a context where companies seek awards and recognition for activities as a health promoting employer (C) the Step Count Challenge offers an opportunity to make their commitment to staff health visible (M) and results in them gaining evidence of their commitment that can be traded for awards and recognition.

Implications for practice

Staff in Paths for All reported in the Stage One workshop that senior leadership engagement is vital for the success of the event, and they have launched a new 'walk at work award'. Based on this theory, this award is likely to lead to more company sign-ups to the Step Count Challenge, as getting the award will appeal to businesses. However, engaging more companies may not lead to engaging

significantly more employees, as the effect of employer leadership seems to be relatively weak. Therefore, targeting individuals as employees may be as effective as targeting employers in terms of sign up to the challenge.

Next step in research

To explore this theory further I would recommend more interviews with company managers to understand more about the theory that rewards and recognition in the area of employee health is an important driver for their business.

Theory Two – A desire to get back to better health

Overview

I argue that The Step Count Challenge contains the resources and possibility for many employees to access better mental and/or physical health. The theories formulated in Stage Two largely held up to the test of Stage Three – in particular, the sense of aligning the Step Count Challenge with personal health goals. The health belief model (Hochbaum, 1958) (Rosenstock, 1974) also had some explanatory potential in that perceived seriousness and susceptibility were a factor for participants. However, the complexity of how participants responded and reasoned with the opportunity of the challenge in their specific health contexts seemed to depend on how challenging and specific the goal was that they had set for themselves. This seems consistent with goal-setting theory (Locke & Latham, 2002).

For some employees, the opportunity of losing a 'few extra pounds' was enough to sign up for the challenge. However, this modest kind of goal could be met relatively easily within the challenge and so sustained commitment to step counting targets throughout every day of the challenge was viewed a more discretionary activity (unless driven by one of the other theories). For others, whose context included a need for significant weight loss, or rehabilitation following serious illness, they signed up with intent to meet challenge targets and benefit from the opportunity. For them step counting was important and in some cases became a core part of how they managed their health condition, often well after the challenge had finished. Because they were 'serious' about the step counts, they also accessed and embraced the concept of challenge (theory 5).

It is important to recognise that participants with health goals were already persuaded of the value of walking to support them and so there was an alignment between their need and the offer being made by the Step Count Challenge. It seemed that an important part of the context for signing up was knowing what walking and step counting could meet their needs and help them achieve their goals. This is entirely consistent with the goal-setting theory (Locke & Latham, 2002) that posits people need to know they have the ability to meet their goal when they set their goal (Swann et al., 2021).

This theory is also explanatory about how and why people react and respond as they do through and beyond the period of the Step Count Challenge.

Final theory

The final revised theory is therefore:

In a context where an individual is aware they have a health issues that could be addressed by walking and where they are already committed to tackling the health issue (C), the Step Count Challenge offers a specific and challenging goal that aligns with their need (M) and helps support them to make progress towards their goal.

Implications for practice

This theory has implications for when health messages about the benefits of walking are best delivered in relation to the Step Count Challenge and suggests that this should be before the sign-up process starts. It also has implications for the context in which baseline and target steps are set and how these relate to personal health goals that could be long (rehabilitation form serious illness) or short term (losing a few pounds gained over holidays). The logic of 10,000 steps should continue to be challenged and participants should be encouraged to see the value of setting lower or higher targets aligned to their goals.

Next step in research

It could be helpful to analyse participants baseline step goals in relation to their personal health goals to establish whether there are patterns or relationships.

Theory Three – Blowing away the cobwebs

Overview

Participants in the Step Count Challenge respond to the opportunity of the challenge to carve out spaces and time for themselves to walk more outdoors. These spaces and time become a valued resource in a context of being busy and sometimes stressed. The source of the stress can come from a combination of work and home. For some, having a reason to be outdoors feels like it is an escape that that helps restore wellbeing and positive mental health. However, for others, the pressure of having to find time to achieve and access this space can add to their stress, even where they are aware of the benefits it could bring.

It's clear that the Step Count Challenge requires participants to find the resource of time and that can cause some participants stress, but also contains the resource of outdoor walking which can alleviate stress. In the case of people who find time, the outdoor space is restorative. For some the experience of having to repeatedly find time to walk outdoors to achieve a target number of steps can become a longer-term wellbeing management strategy and it can lead to an awareness that without walking they can be more stressed and less reasonable as a person. For others who find it stressful to make time to walk regularly, it can be a reason to drop out of the Step Count Challenge.

For some people with young children, finding space to go for a walk, away from their children, was challenging. Some participants responded to this context by taking children walking with them. They reported additional benefits of having better conversations with their children when being outdoors walking and it seemed like creating the space and time benefitted both.

Although people speak of the need to blow away the cobwebs, this need, more than other needs, seemed entrenched in the stresses of juggling time and a vicious cycle of escalating and de-escalating stress based on the time and opportunities available to get outside. For some, being part of the Step Count Challenge made the effort of finding time more possible, for others it was literally a step too far. When linked with Theory Five and Six, the sense of pressure and accountability can also help or hinder. When linked with Theory Four it can be driven and supported by having a challenging and committed health goal.

Final theory

The final revised theory is:

In a context of feeling stressed (C) the Step Count Challenge presents an opportunity to prioritise going for a walk in nature (I) which provides an escape from the stressor/s and (M) restores our

ability to build mental models, be more effective and act meaningfully, thus restoring our ability to be a reasonable person (O).

Implications for practice

The value of self-regulating our stress and moods is important in the context of being effective at work. There is significant value for employers in findings ways to support and enable staff to achieve this. Providing support through enabling staff to walk outdoors through measures such as flexible working could make a significant and immediate contribution to staff wellness.

Next step in research

In this theory I would recommend that a next step would be to understand more about who is and is not able to create space and is therefore more likely to drop out. The data I have would suggest that it is likely to be women with young children (and especially women who are single parents). They may also benefit less from being outdoor in the environment due to fears and concerns about safety. In that context, employers' support to help create space and time could be extremely important.

Theory Four – Teamwork and support of colleagues

Overview

Being in a team created opportunities for participants in the Step Count Challenge to interact with work colleagues in ways that they would not have done otherwise. This interaction generated opportunities to get to know people they had never met, got to learn more about the non-work aspects of their lives and this seemed to add more humanity and fun to work. In some cases, this was also a leveller as people got to know people, regardless of work status. In contexts where people who worked together had few opportunities to socialise together, this was welcomed as something that added value to their working life.

Interestingly, walking together was rarely a reason for being in the Step Count Challenge. Some participants seem to find the idea of walking at work uncomfortable or unwelcome. Perhaps linking back to the idea of their autonomy and right to choose where and when to walk. Walking meetings and group walking at work were not evident in the case study sites.

Most participants interacted with team members through digital tools that were there to support them - such as staff intranets. They also shared their stories and encouraged each other through mainstream social media channels such as Facebook and what's app. There was a good deal of energy generated through sharing stories and images of their personal walking exploits with others in their team. There was sometimes some 'office chat' but, for many, their team-mates worked in different locations or different hours.

Final theory

I have revised the theory as follows:

In a context where individual scores are visible to the group and count towards the group performance (C) individuals in the group seek out ways to connect and communicate with each other (M) and this enhanced communication with workmates can result in feeling supported in the challenge (O) and after the challenge more connected to group members at work (O)

Implications for practice

It is clear that being in a team can be supportive to achieving one's goals as well as having fun. However, it's also clear that physically coming together as a team is not required to access the benefits of teamwork. Digital and social media channels are important resources for participants to

share, support and encourage each other. Given the significant increases in home working, this suggests that the Step Count Challenge will be a durable and perhaps an even more vital tool in the search to find ways to build workplace teams, whilst home working.

Next step in research

Given that walking meetings and walking as groups at work are often promoted as part of both the Step Count Challenge and other workplace health promotion, it would be good to explore this area further. From an implementation perspective, the plethora of images showing staff teams 'walking together' may be less representative of what the challenge entails for many participants. In a COVID context, with significant home working, refreshing images and giving greater weight to connecting digitally should be tested.

Theory Five – Competition and Theory Six - Peer pressure

Overview

Whether at the level of individual, team, workplace or leader-board, the challenge of counting and comparing steps engages those who sign up. The response to the official Step Count Challenge leader-board only seems to be relevant when teams are 'jostling' to be in a significant position such as top three, top ten, top 100 etc. For others, the competition is between teams in a single workplace and is usually facilitated by an off-line version of a leader-board containing only their own workplace scores. The competition at this level can be intense and can lead to very significant increases in individuals' step counts. Where this is the case, sustaining this level of step counts can be a challenge in terms of the time required and the end of the challenge is usually welcomed.

For others, the competition can be within their team, but the focus of attention is to avoid being 'last'. In the Step Count Challenge, aggregated team scores are visible to other teams and individual steps are only visible to each person in the team. To create a workplace internal competition, teams can extract the workplace teams form the overall board and create a local off-line version (NB a new website has now addressed this issue and teams can choose personalised 'views'). The way in which individual and aggregated step counts is shared and made visible is important to accessing and using competition.

Final theory

I simplified this theory to:

In a context where people experience connectedness within their group (C) this connectedness can produce combinations of accountability, social cohesion and pressure (M) that results in more or fewer steps (O)

Implications for practice

The implication of theory five and six is that there is balance to be struck between what you want from the challenge as an individual and what the team collectively wants. The challenge for practice is therefore to understand this interaction and to offer participants ideas and options to improve their experience, if the mix is not right for them. This could include support to join and leave teams during the challenge itself.

Next step in research

The next step would be to illustrate the different pathways that participants can take based on what they want to achieve. These pathways could then be tested again.

Summary

In this chapter I presented the findings from the case studies that were used to test the theories that had been developed in Stage One and Stage Two. Through these case studies I generated rich data about the range of ways in which companies and participants experience a workplace walking programme. When combined with data from Stage One and Stage Two, they offer rich insights that help explain aspects of how such programmes operate.

By presenting conclusions about the individual theories, I have been able to identify some implications for practice and policy and some clear next steps for future research. These are developed further in Chapter Nine.

In Chapter Eight (which follows), I synthesise the overall learning and draw conclusions about a more unified perspective on how the Step Count Challenge might work, and the individual theories may interact. Chapter Nine includes my recommendations in the context of the strengths and limitations of this thesis.

Chapter Eight: Conclusions on how the Step Count Challenge works

Introduction

As I established in Chapter Two there is a strong evidence base for the value of walking for health (Murtagh et al., 2015), (Kelly et al., 2017), (Kelly et al., 2018), (Marquez et al., 2020) and strong policies to encourage the development and implementation of walking interventions (World Health Organisation, 2018), (Public Health England, 2020), (Scottish Government, 2014), (Campbell et al., 2018), including in the workplace setting. The Step Count Challenge is a challenge-based step counting intervention that has been delivered in Scotland since 2012 in response to this evidence and these policies. Although there are data that demonstrate the Step Count Challenge can support participants to increase their step counts (Niven, 2015) (Niven, Ryde, Wilkinson, Greenwood, & Gorely, 2021), there is limited insight into how this change is generated.

In Chapter Three, I proposed realist methods as a possible way of exploring this gap in knowledge. This use of the realist research approach also developed into a more explicit goal to document the use of realist research in the field of physical activity, as no previous studies had extensively documented their working methods in this field. I also aligned the documentation with the RAMESES standards for the conduct of realist research.

Using methods described in Chapter Four, I generated, refined, and tested six realist programme theories. As explained on page 43 the fact that these were a small number of the possible number of programme theories is entirely consistent with realist methods. I address how I think this could be built on and developed in Chapter Nine: Contributions to new knowledge, recommendations, and reflections.

In Chapters Five, Six and Seven I presented the methods and findings from the work to glean realist theories, to refine these theories using a synthesis of published data and then to test them using case studies. I showed how, through working retroductively, it is possible to gather and use data inductively and deductively and to build on informed hunches to create and test theories of how outcomes are generated, and not generated, through mechanisms working and not working in certain contexts.

In this chapter, I return to my overall goal and my conclusions about how the Step Count Challenge works. I'll do this by referring to the specific programme theories that have been generated, refined, and tested and how these may be combined and interact.

What do the individual theories tell us when combined?

Whilst the individual theories illuminate aspects of how the Step Count Challenge might work, this section is intended to offer perspectives on how the theories might interact. In this section, I consider the effects of the interactions on business, teams and individuals and the implications at key points in the Step Count Challenge: signing up, setting a goal, joining a team, working on increasing step counts, drop out and repeated participation.

Workplace walking challenges are complex

First and fore-most the individual theories add more evidence to our existing understanding that workplace walking challenges are complex. The theories set out in previous chapters, even in their partial nature, highlight the emergent and dynamic qualities of how the challenge works. Not only is the intervention complex (multi-component, non-linear causal pathways, context dependant (Petticrew et al., 2019)), it is clear that its outcomes are dependent on interactions that are a

complex system in themselves. This lends support to the argument that interventions are not 'packages' inserted into a context. It demonstrates that interventions generate new properties which emerge from their context (Hawe, Shiell, & Riley, 2009).

In the Step Count Challenge, I found that outcomes of the challenge emerge primarily from individuals and their personal goals (Theory 2) interacting with the dynamics of their groups and teams (Theories 4, 5 and 6). Theory Two showed that where individuals had signed up to the Step Count Challenge with a clear personal health goal this influenced their commitment to step counting. This level of personal focus then interacted with the level of connectedness within their team, resulting in a range of different outcomes. This ranged from being a 'non-event' with almost no interest in step counting, a fun event with the emphasis on being a team (Theory 4) rather than gaining high step counts, a personal challenge with high step count goals (Theory 2), through to competition where the step count goals could be very high (Theory 5 and 6).

These personal and group interactions also generated negative outcomes. The tested theories suggest that weak personal goals (Theory Two) and limited team connectedness (Theory Four) interact to generate low steps or even drop-out based on a non-event. Some of the participants had experienced both kind of teams and were able to compare the experiences as having "had fun" with lots of interaction one year and then "not feeling connected" to the challenge the next year due to limited interactions with their team.

However, where personal goals and team connectedness were both very high, this could interact to create too much stress and pressure leading to drop out or even unethical behaviours such as cheating. As referred to in the case study findings, in one company participants started to ask for "evidence" of actual step counts as the stakes and the steps had become very high. In another company, the stress of having to find enough time to walk so many steps caused so much stress one team member chose to drop out. This also affected their participation in future years, where they chose not to take part.

These interactions and the outcomes they generate, as discussed above, are illustrated in Figure 9 below. This illustrates the interaction between the level of personal goal focus running from low (bottom left) to high (top left) and the level of group connection running from low (bottom left) to high (bottom right). It also shows how increasing levels of stress (top left to right) and growing peer pressure (bottom right to top right) are related to this interaction. The top right box (risk) illustrates how too much pressure and stress can produce the listed negative outcomes.

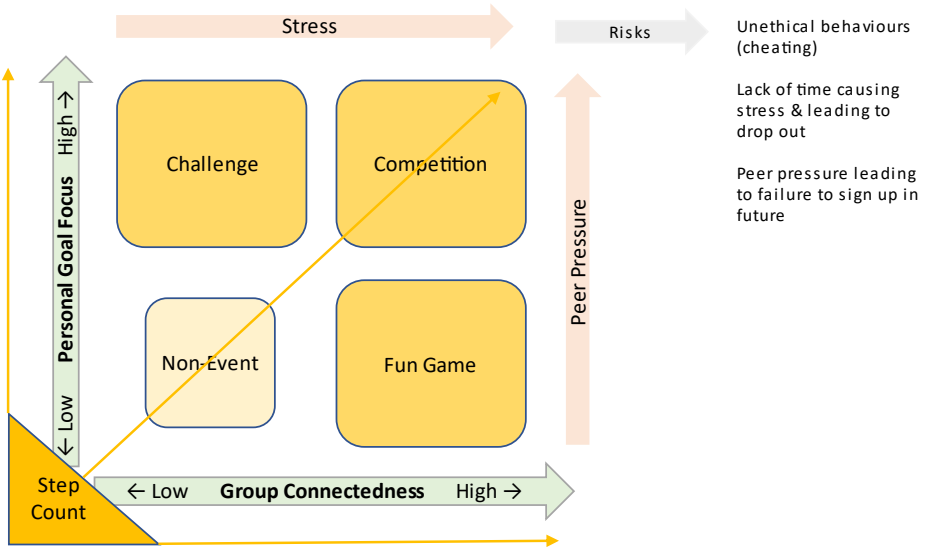


Figure 9: Interactions between individual task focus and group dynamics

I am arguing that the interaction between individuals and their group has a strong influence on the outcome of the challenge in terms of steps taken (including drop out) as well as how that process is experienced socially, thereby also influencing participation in future challenges. These interactions are dynamic and emergent within the challenge itself. These are not the properties of the Step Count Challenge as a package. These interactions and the reactions they spawn are a core part of the complexity that Pawson (2013) (p34-35) argues is inherent in all in social interventions.

In keeping with the realist approach, I believe that I have demonstrated that this complexity can be known. Further, through knowing the nature of the complexity one can intervene to stack the odds for the most favourable outcomes and minimise the least favourable outcomes. My recommendations and improvements in relation to intervening are set out in Chapter Nine: Contributions to new knowledge, recommendations, and reflections.

Workplace walking challenges exist in a multi-layered social environment

In arriving at these conclusions, I identified three new explicit layers of social environment within the Step Count Challenge: an organisational layer (Theory One), a team layer (Theories Four, Five and Six) and the layer of individuals (Theories Two and Three). In the previous section, I outlined the centrality of the interactions between individuals and their teams. In this section, I conclude that the organisational level stands relatively separate, with limited interactions with the team or individual layers beyond the necessary act of signing up.

In Chapter Seven I described the organisational layer as necessary but insufficient for the outcomes of the Step Count Challenge itself. It is interesting to note though how much weight is given to the value and importance of organisational buy-in and leadership by policymakers and by Paths for All. The data from the official documentation and the Paths for All workshop, used to generate initial programme theories in Stage One, showed that significant energy goes into this layer of the Challenge. However, data from Stage Three show that relatively little direct energy or interaction flows though from this level to the teams and participants themselves. There was even a suggestion in the Stage Three data of resisting employer-led interventions and a desire for employee autonomy.

So, why the focus on this organisational level? As set out in Chapter Two, both the World Health Organisation and the World Economic Forum make a strong case for workplace physical activity and invite employers to demonstrate leadership in this area. Scottish Government in their Walking Strategy also reference the role of employers and businesses. Awards such as Healthy Working Lives, Investors in People and more recently the Paths for All Walk at Work Award all signal that doing things to promote walking is a good thing for businesses to be doing.

It's clear then that signing up to the Step Count Challenge allows organisations to demonstrate their commitment to these policies in a visible way and to gather evidence of their commitment that can be traded for awards and recognition – this came across strongly in the interviews with company leaders, reported in Chapter Seven. It is therefore entirely possible for this to be present with limited direct effect on extent or quality of employee participation in the health interventions. I argue that perhaps the lack of understanding about how workplace health interventions work in practice (as set out in Chapter Two) has perhaps led to the links between policies, leadership and outcomes in workplace walking interventions becoming well-established assumptions that have not been robustly tested.

The awards and recognitions perhaps have more resonance with company leaders, politicians and with potential new recruits than with current employees. The latter cited the day-to-day nature of the work itself being their gauge of their organisations' commitment to their health and wellbeing. They also felt the success of the interventions were down to employee efforts exclusively. In Theory One, there had been an initial conceptualisation of employers having a role in giving a sense of 'permission' to employees to 'go for a walk'. This was robustly rejected in the test of this theory in Stage Three.

Workplace walking programmes need not involve walking at work

There is a degree of ambiguity in the conceptualisation of the Step Count Challenge as a *workplace* walking challenge: firstly, participants largely walk alone and secondly, participants undertake most of their walking away from their workplace. While employers give their organisational backing to the Step Count Challenge and encourage their employees to sign up, the nature of the work itself remains a major barrier to walking, both in terms of time available and a range of practical work and work-role considerations.

Walking at work is not practical for many participants due to the nature of their employment (e.g., production lines, customer service functions, highly timetabled tasks). Interestingly, participants also saw the Step Count Challenge being to gather extra steps above the level normally generated in their everyday work, even where those everyday steps were substantial (e.g., 8,000 steps a day on a factory floor). This was partly about being 'challenged' (Theory Five) but also about accessing the benefits and pleasures of walking (Theory Three).

Although highly connected teams perhaps organised a few team walks at lunch breaks or after work, even in these social teams, participants mostly walked alone. The access to team interaction therefore (Theory Four) was not dependant on team walking. For some, where the location of their work and the timing of work shifts permit, commuting to and from work was a major source of step counts and provided access to significant wellbeing benefits (Theory Three).

The point of highlighting the ambiguity is that within my study the evidence linking employer and organisational benefits is greatest in areas where employees were able to access time and space to walk, away from work itself. Staff's own sense of their personal productivity and options to manage

work-related stresses seem to rely on the possibilities to access and time and space away from work. If that space was in nature, then the benefits were potentially even greater (Theory 3).

The value of this is to better gauge the pros and cons of initiatives such as a workplace daily mile or workplace walking meetings. While they both may add to employee steps, they may not deliver the productivity gains those employees can access through attention restoration and personal stress management by walking alone and away from work (Theory Three).

Is there an overarching theory for the Step Count Challenge?

Given the partial nature of the individual theories and the obvious areas where further research would be beneficial, the work to understand how the Step Count Challenge works remains work in progress, to which this study is a significant contribution. Illustrating this contribution has already been demonstrated in the section above and in previous chapters. In this section I am offering an overall conclusions and links to the initial and individual theories.

A contribution to an overarching theory of how the Step Count Challenge works

This overarching (partial) theory is illustrated in Figure 10. This illustrates how each of the theories operates and interact at the level of organisations (blue), teams (yellow) and individuals (green).

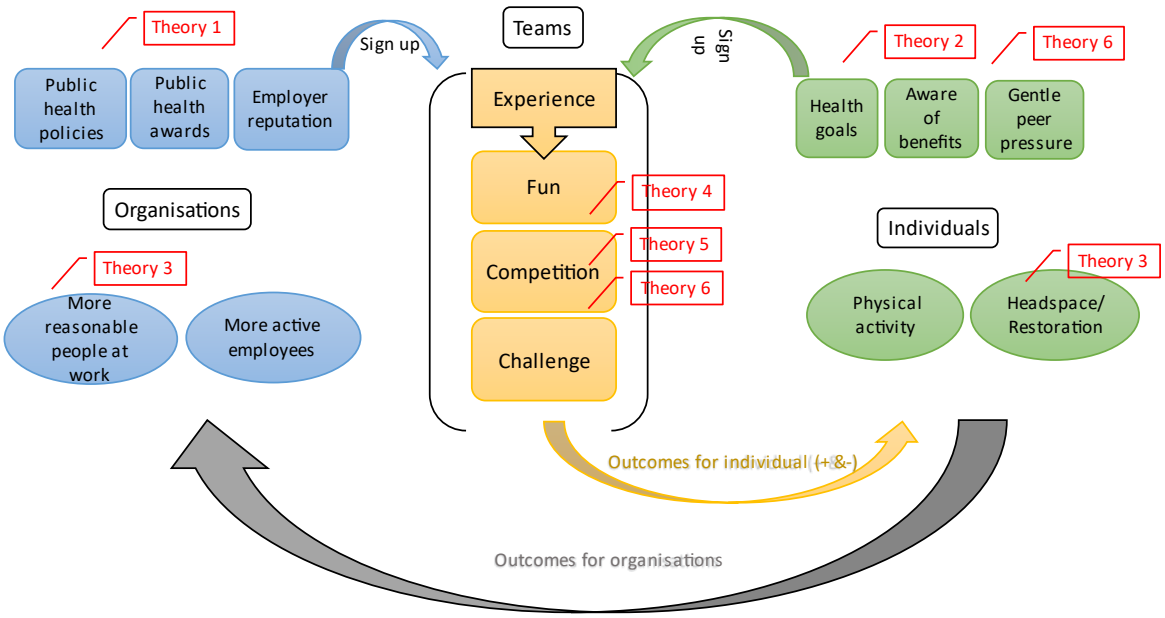


Figure 10: An over-arching theory of how the Step Count Challenge works

Organisational goals that focus on businesses' response to public health policies that are incentivised through awards, such as the Walk At Work Award, provide the necessary conditions for business to sign up to the SCC (Theory One). They are an important but small part of the SCC context. Individuals working in these organisations who are aware of their own health needs and the value of walking to help support their needs are likely to sign up (Theory Two), especially if supported with some gentle peer pressure from colleagues (Theory Six).

Having signed up, the level of connectedness within teams, combined with the strength of one's own goals produces a range of conditions within which mechanisms fire to produce positive and negative outcomes. Fun teamwork (Theory Four), competition and challenge (Theory Five) are all

mechanisms experienced to degrees (+/-) and are also shaped by peer pressure (Theory Six). Depending on a range of personal and work-related contexts, for some participants, finding enough time to walk can be stressful and can lead to drop out.

Outcomes relating to finding more headspace and consequently feeling less stressed, and more reasonable, are immediate and tangible benefits to the individual (Theory Three). With the right conditions in place, team interactions (Theories Four, Five and Six) are important mechanisms that increase step counts and lead to more physical activity. Chapter Two provides evidence that more physical activity can lead to better physical health outcomes, if sustained. The aggregate value of more active employees who find walking is a way to manage stress better, and to restore their focus and attention at work are likely to benefit their employers.

Summary

In conclusion, where practitioners and policymakers expect a range of outcomes to be delivered through a single intervention, in this case physical and mental health outcomes, as well as workplace productivity, it is unlikely that any single behaviour change technique or intervention package will deliver that. The conditions for successful outcomes are generated through the interaction of individuals working with and in teams. The dynamics between individuals and their teams shape whether participants join, stay, achieve goals, drop-out and come back again.

Further, the context and nature of the work culture, the job role and the personal circumstances of the employee can create stresses for individual employees in finding enough time to participate and meet their step count targets. Peer pressure can help individuals both to dig deeper in order to meet goals and to drop out depending on how the pressure experienced.

Whilst complex and challenging to configure, the realist approach complements contemporary ecological models of physical activity (Bauman et al., 2012) and supports the systemic approach advocated in the World Health Organisation's Global Action Plan on Physical Activity (2018). It does this because it offers a way of understanding the interplay between social, environmental, and individual factors, and how each of these may play a role at different stages of an intervention and in different ways for different participants.

Chapter Nine: Contributions to new knowledge, recommendations, and reflections on the strengths and limitations of the study

Introduction

When I set out in November 2017, the goal of this PhD was to contribute new knowledge that could improve the effectiveness of the Step Count Challenge, a specific workplace walking intervention delivered by Paths for All. This final Chapter sets out the contribution I believe I have made. I stated in Chapter One that "by making what can be implicit and intuitive for staff and participants more explicit and testable, I hoped to assist Paths for All to improve their reach and impact". In this Chapter I also provide some specific recommendations for policy and practice on how the reach and impact could be improved.

As an iterative method, realist research can progress to further iterations and further theorising. For those who may wish to develop this area of research I have made recommendations for where I think the obvious next iterations for this research study lie. These could be linked to this research work or could be developed as standalone research studies.

Finally in this Chapter, I provide my assessment of the strengths and limitations of this study.

Contribution to new knowledge

I believe I have contributed new knowledge to the topic of workplace walking, the field of physical activity research and the field of realist methods. I have judged these contributions based on reflecting on the question 'if I were to start again now, having read this thesis, what would be different'. Addressing this question has allowed me to outline my new contributions to knowledge below.

Contribution to workplace walking

When I started this thesis, there were no previous studies that offered explanations for how workplace walking programmes produce their effects. There were few studies that demonstrated effectiveness (Freak-Poli, Cumpston, Peeters, & Clemes, 2013) and the one, non-randomised study of the Step Count Challenge (Niven, 2015) was not able to explain the process of how the inputs of the programme related to the outcomes found in the study.

By adopting a different research approach, I have been able to offer new knowledge to explain how the effects of the Step Count Challenge are produced. These explanations are set out in detail in Chapter Eight (p116). In summary, the new knowledge explains the complexity of these workplace walking programmes, illustrates how they exist in multi-layered social environments and, although set in a workplace context, the walking is undertaken almost entirely away from the workplace.

In Chapter Two (p16), I stated that workplace walking challenges needed stronger programme theories and I now believe that my research provides substantive new knowledge that can assist in building and refining these. As Ray Pawson (2003) describes the value of realist programme theories as 'portable', I argue that the new knowledge may be of value to all workplace walking challenges and not only the Step Count Challenge.

Contribution to physical activity research

In Chapter Three (p27) I stated that a realist research approach may be able to contribute understanding to areas of physical activity where polarised positivist and interpretivist approaches had been unable to offer sufficient explanations. In Chapter Two (p16) I also stated that a realist

approach could be helpful by proactively seeking out learning from a variety of academic fields and methods.

I now believe that by thoroughly documenting my realist method (which is new to the field of physical activity), I have demystified the method for physical activity researchers. I have also demonstrated, for the first time, that taking this approach allows us to reach explanations that have not, to date, been offered by existing methods being used in physical activity research.

Whilst physical activity research is rich in the application and analysis of behavioural theories, I believe that I have had added sufficient new knowledge in Chapter Eight to show the value of research and development based on strong programme theories and theorising. Such programme theories allow us to see that the programme is broader than the intervention itself and includes how people are likely to respond and react in specific contexts. I have contributed new ideas to the debate on the need to adopt this kind of approach to stack the odds in favour of more efficacious physical activity interventions.

Contribution to realist methods

A major contribution to new knowledge has been to add to the growing number of realist research studies by offering one from the field of physical activity. When I started my PhD, most realist studies that I found were in areas of clinical research, criminology and education. This study adds new insights from a new field of research.

I have also applied novel methods within each stage of the study, and I believe that these offer new knowledge about how these specific methods can be applied to enhance realist approaches. In stage one I used participant blogs as the basis for developing programme theory. In doing so, I have highlighted a new source of important and perhaps previously overlooked information that can provide rich sources of data for the programme theorising stage of a study. In a COVID context, where many researchers are working in online environments, my use of published blogs as data to develop theories could be relevant and valuable.

In stage two I used the novel method of adapting an existing Cochrane study search strategy as the starting point for a synthesis. I believe this offers new practical knowledge about how to recycle a positivist search strategy into a realist one. The approach is explained in detail in Chapter Six (p54). Given Cochrane studies in the field of physical activity have rarely been able to draw significant conclusions, due to the small number of included studies, this new approach could add value to these studies.

Finally, I had initially conceptualised my three stages as theory gleaning, theory refining and theory testing. I would now like to offer 'Theory Propositions', 'Theory Options' and 'Theory Reframing' as an alternative new way to conceptualise stages of working with realist approaches and one which is consistent with iterative ways of working. I believe that this new way of labelling stages is helpful to maintain the mindset that realist work develops organically and although theories are tested, the test results in a reframing rather than a 'definitive result'.

Recommendations for those designing and delivering workplace walking programmes

I believe that the process of illuminating how programmes and interventions work leads people to be able to see ways to develop and grow their programmes and interventions for themselves. As one of the people who has now reflected on the findings, I outline what I personally have noted and what I would recommend is explored further in order to improve the reach and engagement in the programme.

Based on the findings from this thesis, I have identified several areas where I think those designing and delivering workplace walking interventions would be able to improve the reach and the effectiveness of their programmes.

Individual goal setting

The learning from Theory Two leads me to suggest that in advance of the start of the challenge, programmes should focus communication and support on the importance of clarifying a strong personal goal and linking goals to relevant step count targets. The more significant the personal goal, the greater likelihood of sustained engagement in the Challenge, and beyond.

Physical health goals, such as weight loss (Theory Two), and mental wellbeing goals, such as more head space (Theory Three) are both likely to have widespread relevance. In the case of the latter there was significant learning from Theory Three that this is an important work-related goal. However, recovery from illness and rehabilitation following injuries are also relevant to individuals' contexts. Focussing on immediate personal health goals is likely to gain more traction with potential participants, rather generic risk reduction and long-term outcomes, which is often a feature of public health messaging.

The fact that Theory One around employer leadership was rejected and the learning gained from that suggests that some of our well-intended public health 'leadership' messaging may not have much traction with individuals. This is consistent with recent findings regarding the evidence to support 'gain-framed' messaging for adult physical activity (Williamson, Baker, Mutrie, Niven, & Kelly, 2020).

Group dynamics

The learning from Theories Four, Five and Six underscores the critical importance of understanding group dynamics in a team-based workplace challenge. In group or team challenges it is likely that the group or team dynamics will affect individual experiences of the challenge – both positively and negatively. Explicit acknowledgement of these dynamics, with suggestions and support for how best this can be managed, will help participants to get the best experience out of the challenge.

Exploring options for participants to opt out of teams or to swap teams during a challenge could also be explored. This could help reduce the risk of dropping out of the challenge by reducing stress and pressure to do more than the individual finds possible or, in some cases increasing the level of the challenge where individuals want to experience more competition. This would address the risks identified as part of Theory Six, when peer pressure can become too much, or not enough.

Worksite walking

Although the Step Count Challenge is a workplace walking programme, it is likely that most employees may prefer to walk where and when they themselves choose to walk. Whilst walking meetings and daily miles at work may appear a 'good idea', they may not deliver the vital mental health and wellbeing benefits many participants get from walking alone and that were central to Theory Three. They may also add pressure to participate in what could be seen as 'an additional employer-led work task' and be negatively experienced. Promoting these should be carefully considered in relation to the specific outcomes being sought. Where this is to 'break up sitting time' this may be a reasonable option. Where this is to promote walking more broadly, other approaches may be more successful.

The use of rewards and recognition for businesses who promote of walking and physical activity more generally, could be an important part of influencing culture to 'normalise' being active.

Pathway mapping: workplaces, groups and individuals

All workplaces, groups and individuals have journeys and stories that start before and continue beyond the period of the challenge. Understanding the context for the business, group or individual is key to understanding the relevance of the challenge at the point in their journey. Theory Two in particular has learning in this respect around the importance of personal goals as a starting point on a pathway.

It could be helpful to illustrate the common 'participation pathways' for businesses, groups and individuals based on the discussion in Chapter Eight and in Figure 9 specifically. This could help support participating business, teams and individuals to 'position' the challenge appropriately in relation to their needs. Improved alignment may optimise the experience for more businesses, groups and individuals and make it easier for consistent internal communication.

As an example, businesses could openly share their ambition to hold a gold level Healthy Working Lives Award and situate their participation in that context. Teams could openly seek out team members who would like to compete seriously for a leaderboard place (Theory Five) or have fun with internal team level competition (Theory Four). Alongside this, individuals could align their goals and likely step counts (Theory Two) with relevant team options. In all cases making choices at different levels more explicit may help increase the likelihood of enabling the context/mechanism/outcome to work together and stack the odds in favour of the best outcomes for the most participants.

Recommendations for further research

Having used an iterative research approach, I naturally began to think about where I would go next with further iterations of this research. These next steps were set out in relation to each theory in Chapter Seven. In additional to these next incremental research steps in Chapter Seven, I have identified three further areas of research. These are discrete and substantive research studies that I feel are merited based on my findings and the potential to make significant steps forward with additional new knowledge.

I hope that these will be helpful to people working in physical activity research, as well as to Paths for All and other research funders.

A further iteration of realist research

Given the interaction between Theory Two and Theories Four, Five and Six, I think it would be valuable to take the findings on goals and group dynamics as a new programme theory and to test and refine this further through a realist synthesis. Such a synthesis could draw on literature in areas specifically related to goal setting and group dynamics. It would be interesting and relevant, as part of the synthesis, to explore the parallels with team and group sports activities and other team or group based physical activity challenges.

A quantitative study

It was not in the scope of this thesis to relate personal step counts to identified mechanisms. However, it would be possible, based on the findings, to test the programme theories quantitatively and consider their value in predicting low steps, high steps and drop-out, in relation to goals and group dynamics. Other contextual factors such as the relevance of employer buy-in and the baseline awareness of the value of walking for health could also be tested in relation to actual step counts. Importantly, a quantitative study would also allow for greater differentiation of the theories based on socio- demographic variables. In particular, the role of gender and caregiving roles and the link to time constraints outside of work could be specific hypotheses to be explored.

Applying the method and some of the theories to other walking programmes

Given the claims (Ray Pawson, 2006b) that realist programme theories are generic and portable, it would be interesting to use the same approach and perhaps some of the theories, such as the value of the outdoors and attention restoration theory, and to explore this with other walking programmes, not in a workplace context. It seems likely that some of the theories that I have developed are relevant to walking programmes and perhaps self-directed walking, rather than to workplace walking challenges specifically.

How important was the realist approach?

In Chapter Three, I argued strongly that a realist approach could help us understand better the complex nature of physical activity interventions, through a more holistic look at contexts, mechanisms and outcomes. Given the value of realist approaches in understanding and explaining complex interventions, I also argued that my use of the method could help answer some of the questions previously unanswered through largely positivist studies.

The programme theorising reported in Chapter Five was a useful activity and to some extent helped Paths for All to think about the components and relationships within the Step Count Challenge in ways that were new and reflective. The realist synthesis presented in Chapter Six broadened the range of possible contexts, mechanisms and outcomes. At this synthesis stage, the risk of being swamped by an overwhelming number of possible configurations was high. However, testing these theories, as reported in Chapter Seven, led to a simplification and clarity about the salient aspects of the theories.

I would argue that had I not used a realist approach, I would not have uncovered how vital the interaction between individual and teams was to create the conditions for positive and negative outcomes. I would also have continued to assume that employer leadership was important to employee engagement, but realist testing of this theory demonstrated this was not the case.

I have concluded that my programme theory provided an initial configuration of core components, the synthesis stage opened options and the testing stage narrowed the options and reframed the theories. If a further synthesis were undertaken to explore the reframed theories, I expect they would open options again and then after further testing they would be reframed. This realist approach of theory iteration was vital to refine the final theories.

The strengths of the study

The methodological quality of the thesis has been demonstrated through alignment with the RAMESES standards. By documenting the methods as fully as possible the thesis provides a way for others to understand, explore and improve the application of the realist method in relation to understanding physical activity interventions. A strength of this thesis is that I have demystified the method by making my process for operationalising the method explicit and aligned with the RAMESES Standards.

I also believe that I have made small contribution to the field in offering greater understanding of mechanisms in physical activity interventions. This is a gap that has been documented and I hope this thesis offers some insights.

Importantly, the thesis offers some pointers to improve the design and delivery of workplace walking challenges, by concluding where there may be more and less fruitful areas for development. Having a collaboration with Paths for All has been a strength that has allowed the findings to be discussed and applied, where relevant. The use of blogs and a podcast, as well as practitioner

focussed conference presentations, has also helped to extend the reach and engagement with the findings.

The limitations of the study

As a new approach for researching physical activity interventions, there are limitations. Most significant of these is the partial nature of the findings. In this study I offer deep and rich insights into aspects of the Step Count Challenge that were clear and strongly salient to participants and stakeholders. I am aware that with additional or alternative data, there could be more or alternative 'realist theories' that could be extracted and modelled. My data is therefore a contribution to work that can be continued and built upon.

Secondly, my experience of working with RAMESES I and II Standards for both realist reviews and evaluation has been mixed. It has been helpful to have clear standards in terms of research conduct. However, to operationalise realist research practice, working retroductively, with multiple data sources, has been challenging. The main challenge has been to document adequately what is a complex and, at times, highly intuitive research process whilst meeting standards of rigour and transparency. The growing number and sophistication of QDAS may make this easier in the future (Bergeron & Gaboury, 2020).

Thirdly, I was also challenged by the fact that there are few published studies that have thoroughly reported on how they generated their realist programme theory, as a starting point for further review and evaluation. While I read some detailed examples (Fick & Muhajarine, 2019) (Shearn et al., 2017) none related to work in workplace physical activity and walking. I hope therefore that I have contributed to assisting people in this field to consider the approach and contribute to the development and use of the method.

Finally, although CMOs may be presented as relatively simple heuristics and equations, their emergence comes from the analysis of large volumes and variety of data sources, analysed in iterative ways. Providing the process is fully documented, then the effort of working in this way will bring rewards in terms of the insights that can be gained about complexity of physical activity interventions. It seems to me that there is value is in putting these efforts out there, incomplete, and imperfect as they may be and working collaboratively as a field to refine these further.

Chapter Ten: Personal reflections arising from the PhD process

Introduction

The process of completing this PhD has been about my own personal learning and development as well as the contribution that I have made to knowledge in the field of physical activity and realist research. In this section I outline the main learning that I have taken from this process.

Key reflections

It's not about thinking it's about writing

The experience of completing this PhD was more than the completion of this thesis. After 30 years of working, I was able to work more slowly and deliberately. I thoroughly enjoyed the writing process and that was surprising to me. I found that the clarification of my ideas came from trying to write about those ideas in a succinct way, particularly when the ideas were complex. Previously, I had thought that I needed more time to think, but I have learned that time to write is how I can best clarify my thoughts. I also learned that writing retreats, both short sessions and long breaks, were the best way for me to achieve that clarity.

Making a difference to programme design and delivery

I have also learned that I enjoy doing evaluation work where the goal is to use research approaches to help people improve what they do. Through this learning I have come to recognise that being a researcher within a team of practitioners is where I feel I can add most value and do work that is meaningful for me. Blending my facilitation skills with research skills has helped me to identify a way of working that supports groups to learn and improve what they do. I now hope I can build on and refine that way of working.

I am now excited to experiment with bringing together gestalt coaching approaches, facilitation, and realist research in an approach to change and improvement work in practice.

Methods bring discipline, but perhaps step aside from them too?

Would I do another realist research study? I would apply the method of teasing out the relationships between context, mechanisms, and outcomes again. I think there is a discipline in that way of working that brings greater clarity. However, I am likely now to be more comfortable taking a more pragmatic approach. I think the process of piecing together specific C, M and O configurations can at times detract from building 'good theories'. It can also be excluding for those not familiar with the specific method and I was uncomfortable that this felt, at times, elitist.

I experienced the iterative and retroductive practice of realist research as extremely pragmatic. The idea that I bring myself and apply all my experiences in an investigative way when I analyse data felt honest. However, the challenge of documenting this thought process transparently can feel overwhelming.

To publish or not to publish?

I tried to publish both my programme theory and my realist review. Although I received only one rejection, I received many more 'this article is not for us' emails. I had wanted to publish in what would be regarded as core physical activity journals, but none were interested in publishing papers about programme theory or realist methods. Research findings and latterly 'COVID-related research findings' were what was being sought.

I was sad about this as there seemed limited appetite for being open to new ways of doing physical activity research, despite the known limitations of traditional methods. I remain undeterred and will now seek to publish in social methods journals.

My final thoughts

I feel proud of myself for using a research methodology that was new to me and to physical activity research more broadly. It challenged me to think and work in a new way. In the early stage of the PhD, I considered whether I should abandon the approach as it seemed impenetrable, at times contrived and yet tantalisingly sensible and, dare I say, 'realistic'. However, as I pushed through, scaffolded it around the RAMESES standards and talked to more people using the method, I started to recognise that this was a methodology that was still 'a work in progress'. I hope that my use of it has made a small contribution to its journey.

So, what about the Step Count Challenge? Anyone who has participated would recognise that there are competitors as well as participants that are not very engaged with their step count. Participants would also know it can all get a little too much for us some weeks and that the great teams can have a lot of fun. I hope, because of this thesis, we now understand a little more about how and why this might be the case. I also hope, based on better understanding, that we can now focus a little more of our efforts on stacking the odds in favour of improved outcomes for more businesses, teams, and individual participants.

I also believe that 'Raiders of the Lost Parks' was the best team name ever!

Appendices

Appendix 1: Ethical approval for Stage One

THE UNIVERSITY of EDINBURGH
Moray House School of Education

Research & Knowledge Exchange
Moray House School of Education
The University of Edinburgh
Old Moray House
Holyrood Road
Edinburgh EH8 8AQ

D/D +44 (0)131 651 6388
S/B +44 (0)131 650 1000

www.ed.ac.uk

Date: 03/05/18

Our Ref: 1227

Dear Mary Allison

Title: A Realist Evaluation of the Step Count Challenge. Phase One: Developing a Programme Theory

The School of Education Ethics Sub-Committee has now considered your request for ethical approval for the studies detailed in your application.

This is to confirm that the Sub-Committee is happy to approve the application and that the research meets the School Ethics Level 2 criterion. This is defined as "applies to non-intervention research where you have the consent of the participants and data subjects. This may include, for example, analysis of archived data, classroom observation, or questionnaires on topics that are not generally considered 'sensitive'. This research can involve children or young people, if the likelihood of risk to them is minimal".

A standard condition of this ethical approval is that you are required to notify the Committee, of any significant proposed deviation from the original protocol. The Committee also needs to be notified if there are any unexpected results or events once the research is underway that raise questions about the safety of the research.

Should you receive any formal complaints relating to the study you should notify the MHSE Ethics Committee immediately by email to MHSEthics@ed.ac.uk

Yours sincerely

David Beamish

Dr Ailsa Niven
Convener, School Ethics Sub-Committee

Appendix 2: Ethical approval for Stage Three

THE UNIVERSITY of EDINBURGH
Moray House School of Education

Research & Knowledge Exchange Office
Moray House School of Education and Sport
The University of Edinburgh
Old Moray House
Holyrood Road
Edinburgh EH8 8AQ

D/D +44 (0)131 651 4846
S/B +44 (0)131 650 1000

www.ed.ac.uk

Ref: 2530

Date: 29th August 2019

Dear Mary,

Title: A Realist Evaluation of the Step Count Challenge. (Stage 3)

The School of Education and Sport Ethics Sub-Committee has now considered your request for ethical approval for the studies detailed in your application.

This is to confirm that the Sub-Committee is happy to approve the application and that the research meets the School Ethics Level 2 criterion. This is defined as "applies to non-intervention research where you have the consent of the participants and data subjects. This may include, for example, analysis of archived data, classroom observation, or questionnaires on topics that are not generally considered 'sensitive'. This research can involve children or young people, if the likelihood of risk to them is minimal".

A standard condition of this ethical approval is that you are required to notify the Committee, of any significant proposed deviation from the original protocol. The Committee also needs to be notified if there are any unexpected results or events once the research is underway that raise questions about the safety of the research.

Should you receive any formal complaints relating to the study you should notify the MHSE Ethics Committee immediately by email to MHSEthics@ed.ac.uk

Yours sincerely,

Ben Scullion

On behalf of:
Dr Ailsa Niven
Convener, School Ethics Sub-Committee

Agenda	Tools/Materials required
Introduction, scene setting & contracting Explain what overall study so we start on same page. Share what I have been doing (document analysis and theories of change from participants' point of view). Explain that the next stage is to form of theory of change from their point of view. Reassure that there is no correct answer – important to flesh out all the 'mental maps' of people involved. Share the programme complexity diagram so they can see 'their place' in complexity of programme. Contracting - Distribute ethics forms and ask for completion Explain that the rest of the session will be participatory Parking lot sheet for 'off focus but interesting' questions Check whether people have any points of clarification at this stage	6 copies of programme complexity diagram to circulate Ethics forms to circulate 'Parking Lot' sheet pre-made and on wall
Outcomes **Explain:** This first task is to identify why the Step Count Challenge Matters, why does it exist. **Activity – One big thing** - You each have a beautiful piece of card. On that piece of card finish the following sentence: "The Step Count Challenge exists to …" - Share your stories one at a time. Facilitator to add cards one at a time to the sticky wall.	6 nice cards 6 marker pens
Pre-conditions/Intermediate outcomes **Explain:** The purpose of this exercise is now to understand a little more about what needs to happen for this to be achieved. That is all the necessary things that taken together would be sufficient to achieve the outcome. These must	

Agenda	Tools/Materials required
be NOUNS. Don't be concerned about the resources that are actually available to you currently/historically – this is the 'theory' of the programme. **Assumption** – we have 2 or 3 big things max (if not then quick vote for ones we focus on). **Activity – Pre-condition chain building** - Work as one group - Write preconditions on post-its (give one example, such as awareness raised) - Place in relation to outcomes and to each other (intermediate outcomes/pre conditions/pre-pre conditions) on paper tablecloth (right to left)	Post-it in three colours
Option for Quick Comfort Break (5mins)	
Key activities **Explain:** The purpose of this is to identify your key activities, how and where they assist on the pathway. This time we have 2 colours – one for things you do and one for things that you could do. Remember though it's things that would be appropriate and reasonable for you to do. **Activity – Activity chain building** - Work on your own - take 5-10 minutes to reflect from your personal area of responsibility or knowledge. - Start writing down on post-its and add to map on the table - If it delivers or connects to more than one thing put it in more than once - Don't worry about duplicates/overlaps	Post its in two more colours
Key Assumptions	

Agenda	Tools/Materials required
Explain: It will be helpful now to think about how PLAUSIBLE this theory is. Looking at it as a whole, does it make sense? **Activity** - Do you want to add/remove anything from the map? - Do you want to add any caveats/annotations? **Explain:** It will be helpful now to think about how FEASIBLE this theory is. Is there anything going on (in the world!) that may make getting this theory/plan off the ground a challenge? **Activity - Brainstorming** • Brainstorm as a whole group. Write down everything, keep going rapidly until no more ideas.	Pens and extra stickers for annotations Flip chart paper
Wrap up and close Recap: Today you spent time: • Reflecting on the outcomes of the Step Count Challenge • Discussing how you think these outcomes are generated • Developed your collective mental map of how the challenge works. The outcomes of this workshop will be added to the review of documentation and to interviews with team leaders/coordinators Check if any questions or final thoughts – explain that they can be in touch at any time to contribute or ask questions. Thank everyone for their time.	

Interviews with Workplace Coordinators

1. Purpose of the interview

To gather data that will provide additional insight into how the SCC produces its effects – who does it work for, in what circumstances, how and why. This is being gathered at this stage in order to:

(i) further refine the existing programme theories (deductive)

(ii) add possible new programme theories or substantive new themes within existing theories (inductive)

The workplace coordinators will bring a perspective at the meso level of the programme – the specific workplace/worksite. (macro level being the overall policy and programme design which is Paths for All perspective and micro level being the perspective of individual participants and their individual team).

2. Interview Guide for SCC Workplace Coordinators

Introduction

[Note: I will introduce myself, the research and the ethics consent]

"As you know, I'm X from Y. I'm working with A to help them learn more about how the SCC works in practice. In particular, we're keen to understand what it is about the SCC that means some people get more out of it than others. We know there were will lots of aspects to that, which is why I have a long time to study this! We have some perspectives on the question from Paths for All staff and from participants. We are really keen today to hear from you about your workplace perspective." [Proceed to ethics consent form]

Questions

[Note: Questions 1-5 are to ease us into the interview and gather some general information about them and the SCC in their workplace.]

1. When did you (personally) first get involved in the SCC? (If obvious its different, then secondary question 'What about at this workplace, when did you first get involved here?')
2. Tell me what you think the aims of the SCC are?
3. What were the main reasons for this workplace getting involved in the SCC initially? And what about now, what are the main reasons now?
4. And roughly how many teams do you usually have in the main spring challenge? And what about the autumn challenge?
5. Is there much variation here in how many teams take part? And what about who takes part, is there much variation in who participates? What about the senior management, do they participate too?

[Note: Questions 6-11 are about 'realist context': personal, team, culture, infrastructure]

6. From your experience, what have you noticed about the people who get the most positive SCC experience around here? And what about those who have a less positive experience, what have you noticed about them?

7. How much encouragement/persuasion do you need to contribute to get the SCC up and running here? What does that look like/what do you have to do?

8. Again, from your experience here, what have you noticed are the ingredients of a 'good team' in the SCC? And what about less positive team experiences, what have you noticed might lead to that kind of experience?

9. How do you think your experience or the experience of employees in past SCC(s) influences how you go about delivering SCC here now?

10. Are there any things that get in the way of the SCC or make it difficult for some people or teams in this workplace? I'm thinking about, for example, the type of role they have or kind of work they do?

11. It seems from what I have read so far that there could be other external factors that could affect what staff are able to get out of the SCC? I'm thinking about what it's like to walk in and around here, as an example?

[Note: Questions 12-16 are designed to explore 'realist mechanisms' - Reassure them that it's okay to talk about their hunches or things that might be going on slightly below the surface]

Introduction to these questions

"The SCC has teams, challenges, prizes, competitions, goals etc and it last for 8 weeks. In any workplace, there's a lot that can happen over that time. We're keen to get to grips with some of the dynamics of change for people personally and for your workplace as a whole"

12. Of all the things that Paths for All/The SCC provide as part of the process, what are the things that you think people here really latch onto? [Prompt if necessary, thinking about blogs, health information, competitions and prizes, leader boards)

13. How do you think the challenge part/the public aspect of step counts works for your employees? I'm thinking about within teams, between teams and within the SCC as a whole?

14. Do you think the SCC affects relationships and team-work? In what ways does it do this?

15. Are there any important things that are working well for this workplace because of the SCC?

16. I'm wondering if there are any stresses or tensions as a results of the SCC?

[Note: Questions 17-19 allow for some reflection on the bigger picture again]

17. What do you think the SCC brings that employees wouldn't do for themselves anyway?

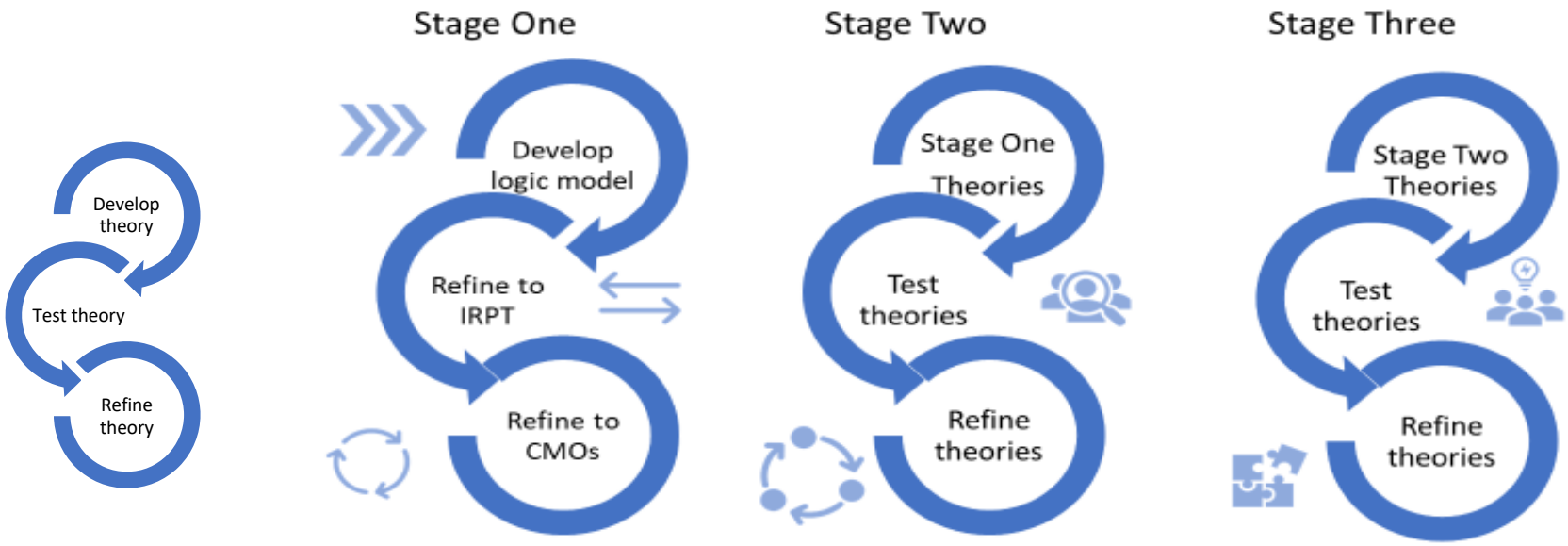
18. What's your 'ideal' SCC here in this workplace?

19. Is there anything else you'd like to say about the SCC that we haven't covered?

Thank you for taking part and sharing your experiences

I'll be sharing progress with this study through blogs and newsletters

Appendix 5: Material used to guide the focussed group discussion



1. To what extent do the Stage Two theories (individually and/or collectively) make sense in relation to how workplace walking challenges might work, for whom, in what context and why.
2. To what extent and in what ways could these Stage Two theories be improved; either through deletions, additions or refinements to any of the contexts, mechanisms or outcomes.
3. How might these theories work in relation to each other and through time (pre/during/post challenge).

PERMISSION AND COLLECTIVE ACTION *In a context where employers have embraced the need to address the health and wellness of their employees (C) signing up to the SCC provides a way to demonstrate their leadership and commitment to physical activity (M) resulting in more staff signing up to the challenge (O)*. This provides a link to a further refinement of the CMO: *In a context where multiple employees sign up to the SCC (C) there is a sense of collective efficacy (M) that they can overcome work-related barriers to moving more and sitting less (O)*	The theory shows that there is a link between the nature and quality of leadership, the willingness of staff to sign up and the belief that workplace barriers can be overcome. How and to what extent does this work in different contexts and why? Where larger number of employees sign up, is there a sense of collective efficacy (and at what level – team/workplace)?

For those who work in roles which are emotionally and cognitively demanding and who may experience work-related stress as a consequence (C) participating in an intervention that encourages walking outdoors (I) provides an escape from the stressors (M) and provides a place where balance can be restored (O). *For those who work in places where there is easy access to modest nature spaces and who have roles which are emotionally and cognitively demanding and who may experience work-related stress as a consequence (C) participating in an intervention that encourages walking in that environment (I) provides an escape from the stressors (M) and provides a place where balance can be restored (O).* *In a context where employers have embraced leadership for the health and wellness of their employees (C) staff feel empowered to leave their workplace (M) allowing them to escape stressors and restore attention (O).* *For those who work in places where there is access to green and blue spaces and who have roles which are emotionally and cognitively demanding and who may experience work-related stress as a consequence (C) participating in an intervention that encourages frequent breaks to walk in that environment (I) provides escape from the stressors of work creating a pause when demands cease and energy is restored (M) which when repeatedly experienced gives an increased sense of self-regulation/control, resulting in higher vigor and dedication, and lower cynicism and professional inadequacy (O* *In a context of feeling stressed out by information overload (C) the SCC presents an opportunity to go for a walk in nature (I) which provides an escape from the stressor and (O) restores our ability to build mental models, be more effective and act meaningfully, thus restoring our ability to be a reasonable person.*	STRESS AND GREENSPACE The theory shows that there is a link between the nature of work and the value of being outdoors in greenspace to escape stress and restore attention. There is a number of questions to explore here: to what extent do people relate to that general theory; what is the role of leadership in feeling that you have permission to go outdoors; how important is the proximity/quality of the greenspace; is walking in greenspace more restorative for some job roles than others; does walking alone or walking in a group feel different? Does walking during your working day feel different to before or after work? Has the availability of smart phones generated a greater need for this? Does the context of work (home working, open plan working, private offices, desk based, mobile etc) alter the mechanism?

GOALS AND HEALTH *Signing up* *In a context of injury or illness (C), the discord/discrepancy that we feel between our actual and our ought selves drives us (M) to join an intervention that we perceive will help us recover/improve (O).* *Sticking with it* *In a context of being in an intervention that we find is supportive when we are seeking to 're-condition' (C), the sense of growing alignment between our 'actual' and our 'ought' selves (M) keeps us in the intervention (I)* *Leaving when it makes sense to do so* *In a context of being in an intervention that we find is supportive when we are seeking to 're-condition' or recover (C), reaching a point when we feel an equilibrium between our 'actual' and our 'ideal' selves (M) means we may choose to stop participating in the intervention (O)*	The theory suggests that we are often feeling 'out of kilter' with ourselves and that programmes such as this can help get us feeling back on track/even keel – to what extent does that make sense? To what extent do our personal goals drive our engagement in a team-based challenge? How does that feel at different stages in the challenge? How do we define a successful participation for ourselves? When it is not working for us personally, how do we exit and when? Why do we stay, (if we feel it's not working for us)?

COMPETITIVE PEOPLE *In a context where people already enjoy an active life and feel little anxiety about being active (C), the SCC as a competitive opportunity 'piques' their interest (M) and engages them to sign up to the challenge (O).* *In a context where 'competitive people' have signed up for the SCC (C) the visibility of a leader board enables social comparison (M) which can lead to both positive and negative experience of the competition.*	The theory suggests that walking challenges are just as relevant to people who are highly active, they just experience it differently. To what extent does it make sense that already active people may get something out of doing a step counting/walking challenge? How is their interest engaged? How is their interest maintained? What is the effect of their participation on others?

PRESSURISED *In a context where people have been pressurised into joining a team and do not feel confident about physical challenges (C), the SCC can provide a period of sustained controlled motivation through feelings of guilt and shame (M) resulting in adherence to increasing step counting for the duration of the challenge (O)* *In a context where people are adhering to a fixed period of behaviour change under pressure from others (C) the end of that fixed period brings a welcome relief (M) that the behaviour can return to the previous habitual state.*	The theory suggests that peer pressure can be both helpful and unhelpful depending on how it is done and at what stage. To what extent does peer pressure work in getting people to sign up? To what extent does it work to keep people involved? How does it feel to be pressurised into the challenge? In the context of pressure what outcome would you be seeking?

ACCOUNTABILITY, TEAM WORK, SOCIAL *In a context where the performance of the SCC team is judged by the aggregated performance of visible individual scores with in the SCC team (C) a sense of accountability between team members spurs people on (M) and results in people doing more steps than they may have without the visibility (O).* *In a context of national intervention that has flexibility to be locally tailored (C) teams can have fun creating a sense of ownership (M) that gives great enjoyment and a better experience (O)* *In a context where participation is contingent on time away from family and others (C) being able to find ways to 'kill two birds with one stone' and involve others in the intervention (M) can make participation possible.*	The theory suggests that the challenge can be experienced socially, both in terms of accountability and as fun. To what extent is the SCC experienced socially? What kind of social experience is it? Who does the social experience involve/not involve? How does the social experience play out through and beyond the challenge? What was the initial/ongoing context for the social experience?

References

Abraham, C., & Graham-Rowe, E. (2009). Are worksite interventions effective in increasing physical activity? A systematic review and meta-analysis. *Health Psychology Review, 3*(1), 108-144.

Aiello, J. R., & Douthitt, E. A. (2001). Social Facilitation From Triplett to Electronic Performance Monitoring. *Group Dynamics: Theory, Research, and Practice, 5*(3), 163-180. doi:10.1037/1089-2699.5.3.163

Alkin, M. (2004). *Evaluation Roots*. Thousand Oaks, California: SAGE Publications, Inc.

Anderson, L. M., Petticrew, M., Rehfuess, E., Armstrong, R., Ueffing, E., Baker, P., . . . Tugwell, P. (2011). Using logic models to capture complexity in systematic reviews. *Research Synthesis Methods, 2*(1), 33-42. doi:10.1002/jrsm.32

Archer, M. S. (1995). *Realist social theory : the morphogenetic approach*. Cambridge: Cambridge University Press.

Archer, M. S. (2014). Culture and Socialization in Late Modernity: ICS, Universidad de Navarra.

Arrogi, A., Schotte, A., Bogaerts, A., Boen, F., & Seghers, J. (2017). Short- and long-term effectiveness of a three-month individualized need-supportive physical activity counseling intervention at the workplace. *BMC Public Health, 17*. doi:10.1186/s12889-016-3965-1

Astbury, B., & Leeuw, F. L. (2010). Unpacking Black Boxes: Mechanisms and Theory Building in Evaluation. *American Journal of Evaluation, 31*(3), 363-381. doi:10.1177/1098214010371972

Bandura, A. (1977). *Social Learning Theory*. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1997). *Self-efficacy: the exercise of control*. New York: W.H. Freeman.

Bandura, A. (2004). Health Promotion by Social Cognitive Means. *Health Education & Behavior, 31*(2), 143-164. doi:10.1177/1090198104263660

Barton, J., Bragg, R., Wood, C., & Pretty, J. (2016). *Green exercise: Linking nature, health and well-being*. Oxon: Routledge.

Batt, M. E. (2009). Physical activity interventions in the workplace: the rationale and future direction for workplace wellness. *British Journal of Sports Medicine, 43*(1), 47. doi:10.1136/bjsm.2008.053488

Bauman, A. E., Reis, R. S., Sallis, J. F., Wells, J. C., Loos, R. J., & Martin, B. W. (2012). Correlates of physical activity: why are some people physically active and others not? *The Lancet, 380*(9838), 258-271. doi:10.1016/S0140-6736(12)60735-1

Bergeron, D. A., & Gaboury, I. (2020). Challenges related to the analytical process in realist evaluation and latest developments on the use of NVivo from a realist perspective. *International Journal of Social Research Methodology, 23*(3), 355-365. doi:10.1080/13645579.2019.1697167

Bhaskar, R. (1978). *A realist theory of science* (Second edition.. ed.). Atlantic Highlands, N.J.: Harvester Press.

Biddle, S. (2016). Physical activity and mental health: evidence is growing. *World psychiatry : official journal of the World Psychiatric Association (WPA), 15*(2), 176-177. doi:10.1002/wps.20331

Bize, R., Johnson, J. A., & Plotnikoff, R. C. (2007). Physical activity level and health-related quality of life in the general adult population: A systematic review. *Preventive Medicine, 45*(6), 401-415. doi:10.1016/j.ypmed.2007.07.017

Blom, B., & Morén, S. (2011). Analysis of Generative Mechanisms. *Journal of Critical Realism, 10*(1), 60-79. doi:10.1558/jcr.v10i1.60

Bojd, B., Song, X., Tan, Y., & Yan, X. (2018). Gamified Challenges in Online Weight-Loss Communities. *SSRN*, 34. Retrieved from https://ssrn.com/abstract=3157331

Bonell, C., Fletcher, A., Morton, M., Lorenc, T., & Moore, L. (2012). Realist randomized controlled trials: a new approach to evaluating complex public health interventions. *Soc Sci Med, 75*. doi:10.1016/j.socscimed.2012.08.032

Bonell, C., Moore, G., Warren, E., & Moore, L. (2018). Are randomised controlled trials positivist? Reviewing the social science and philosophy literature to assess positivist tendencies of trials of social interventions in public health and health services. *Trials, 19*(1), 238. doi:10.1186/s13063-018-2589-4

Booth, A., Wright, J., & Briscoe, S. (2018). Scoping and searching to support realist approaches. In N. Emmel, J. Greenhalgh, A. Manzano, M. Monaghan, & S. Dalkin (Eds.), *Doing Realist Research* (pp. 147-165). London: SAGE Publications Limited.

Bravata, D. M., Smith-Spangler, C., Sundaram, V., Gienger, A. L., Lin, N., Lewis, R., . . . Sirard, J. R. (2007). Using Pedometers to Increase Physical Activity and Improve Health: A Systematic Review. *Jama, 298*(19), 2296-2304. doi:10.1001/jama.298.19.2296

Brinkley, A. J., McDermot, H., & Munir, F. (2017). Team sport in the workplace? A RE-AIM process evaluation of 'Changing the Game'. *AIMS Public Health, 4*(5), 466-489.

Budzynski-Seymour, E., Milton, K., Mills, H., Wade, M., Foster, C., Vishnubala, D., . . . Steele, J. (2020). A rapid review of communication strategies for physical activity guidelines and physical activity promotion: A review of worldwide strategies (Pre-Print). *SportRxiv*. doi:https://doi.org/XX.XXXX/osf.io/XXXXX

Butler, C. E., Clark, B. R., Burlis, T. L., Castillo, J. C., & Racette, S. B. (2015). Physical Activity for Campus Employees: A University Worksite Wellness Program. *Journal of Physical Activity & Health, 12*(4), 470-476. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=s3h&AN=103674622&site=ehost-live

Campbell, A., Calderwood, C., Hunter, G., & Murray, A. (2018). Physical activity investments that work—Get Scotland walking: a National Walking Strategy for Scotland. *British Journal of Sports Medicine, 52*(12), 759. doi:10.1136/bjsports-2017-098776

Chau, J. Y., Grunseit, A. C., Chey, T., Stamatakis, E., Brown, W. J., Matthews, C. E., . . . van der Ploeg, H. P. (2013). Daily Sitting Time and All-Cause Mortality: A Meta-Analysis. *PLoS One, 8*(11), e80000. doi:10.1371/journal.pone.0080000

Chen, H. T. (1990). *Theory Driven Evaluation*. Thousand Oaks, California: Sage.

Chen, H. T., & Rossi, P. (1980). The Multi-Goal, Theory-Driven Approach to Evaluation: A Model Linking Basic and Applied Social Science. *Social Forces, 59*(1), 106-122. doi:10.2307/2577835

Cherniack, M., & Lahiri, S. (2010). Barriers to implementation of workplace health interventions: an economic perspective. *J Occup Environ Med, 52*(9), 934-942. doi:10.1097/JOM.0b013e3181f26e59

Choi, B. C. K., Pak, A. W. P., & Choi, J. C. L. (2007). Daily step goal of 10,000 steps: A literature review. *Clinical and Investigative Medicine, 30*(3), 6. doi:https://doi.org/10.25011/cim.v30i3.1083

Colley, K., Brown, C., & Montarzino, A. (2016). Restorative wildscapes at work: an investigation of the wellbeing benefits of greenspace at urban fringe business sites using 'go-along'interviews. *Landscape Research, 41*(6), 598-615.

Colley, K., Brown, C., & Montarzino, A. (2017). Understanding knowledge workers' interactions with workplace greenspace: Open space use and restoration experiences at urban-fringe business sites. *Environment and Behavior, 49*(3), 314-338.

Collier, A. (1994). *Critical realism : an introduction to Roy Bhaskar's philosophy*. London: Verso.

Craig, P., Dieppe, P., Macintyre, S., Nazareth, I., & Petticrew, M. (2008). Developing and evaluating complex interventions: the new Medical Research Council guidance. *Br Med J, 337*. doi:10.1136/bmj.a1655

Craig, P., & Petticrew, M. (2013). Developing and evaluating complex interventions: reflections on the 2008 MRC guidance. *Int J Nurs Stud, 50*. doi:10.1016/j.ijnurstu.2012.09.009

Dalkin, S. M., Greenhalgh, J., Jones, D., Cunningham, B., & Lhussier, M. (2015). What's in a mechanism? Development of a key concept in realist evaluation. *Implementation Science, 10*, 49. doi:10.1186/s13012-015-0237-x

de Bloom, J., Sianoja, M., Korpela, K., Tuomisto, M., Lilja, A., Geurts, S., & Kinnunen, U. (2017). Effects of park walks and relaxation exercises during lunch breaks on recovery from job stress: two randomized controlled trials. *Journal of Environmental Psychology, 51*, 14-30.

de Souza, D. (2013). Elaborating the Context-Mechanism-Outcome Configuration (CMOc) in realist evaluation: a critical realist perspective. *Evaluation, 19*(2), 141-154. doi:10.1177/1356389013485194

Deci, E. L., & Ryan, R. M. (2008). Self-Determination Theory: A Macrotheory of Human Motivation, Development, and Health. *Canadian Psychology, 49*(3), 182-185. Retrieved from https://search.proquest.com/docview/220814261?accountid=10673

Delaney, K. (2010). *10,000 Steps a Day to Decrease Chronic Disease Risk Factors and Increase Aerobic Physical Activity Levels Among Capital Regional District Office Workers in Victoria, BC.* (MASTER OF ARTS). Western State College, Colarado,

Deloitte. (2018). *Global Human Capital Trends*. Retrieved from www.deloitte.com/insights/us/en/focus/human-capital-trends/2018/introduction.html

Ding, D., Lawson, K. D., Kolbe-Alexander, T. L., Finkelstein, E. A., Katzmarzyk, P. T., van Mechelen, W., & Pratt, M. (2016). The economic burden of physical inactivity: a global analysis of major non-communicable diseases. *The Lancet, 388*(10051), 1311-1324. doi:10.1016/S0140-6736(16)30383-X

Dishman, R. K., Oldenburg, B., O'Neal, H., & Shephard, R. J. (1998). Worksite physical activity interventions. *American Journal of Preventive Medicine, 15*(4), 344-361. doi:10.1016/S0749-3797(98)00077-4

Donnachie, C., Wyke, S., Mutrie, N., & Hunt, K. (2017). 'It's like a personal motivator that you carried around wi'you': utilising self-determination theory to understand men's experiences of using pedometers to increase physical activity in a weight management programme. *International Journal of Behavioral Nutrition and Physical Activity, 14*(1), 61. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5420087/pdf/12966_2017_Article_505.pdf

Dugdill, L., Brettle, A., Hulme, C., McCluskey, S., & Long, A. (2008). Workplace physical activity interventions: a systematic review. *International Journal of Workplace Health Management, 1*(1), 20-40. Retrieved from https://www.emeraldinsight.com/doi/pdfplus/10.1108/17538350810865578

Easton, G. (2010). Critical realism in case study research. *Industrial Marketing Management, 39*(1), 118-128. doi:10.1016/j.indmarman.2008.06.004

Ekelund, U., Steene-Johannessen, J., Brown, W. J., Fagerland, M. W., Owen, N., Powell, K. E., . . . Lee, I. M. (2016). Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women. *The Lancet, 388*(10051), 1302-1310. doi:https://doi.org/10.1016/S0140-6736(16)30370-1

Fadli, F., Prestwich, A., & Sykes-Muskett, B. (2018). Assessing Mediating Effect of Motivation Types on Competition Intervention For Physically Inactive Adults. *Jurnal Ilmiah Peuradeun, 6*(1), 1-16.

Faulkner, G. E. J., & Taylor, A. H. (2005). *Exercise, health and mental health emerging relationships*. London New York: Routledge.

Fick, F., & Muhajarine, N. (2019). First steps: creating an initial program theory for a realist evaluation of Healthy Start-Départ Santé intervention in childcare centres. *International Journal of Social Research Methodology, 22*(6), 545-556. doi:10.1080/13645579.2019.1595375

Forster, N., P, H., SM, D., M, L., & SM, C. (2015). Using NVivo to enhance transparency in a realist evaluation. Retrieved from http://www.qsrinternational.com/nvivo/nvivo-community/the-nvivo-blog/how-researchers-use-nvivo-to-enhance-transparency

Freak-Poli, R. L. A., Cumpston, M., Albarqouni, L., Clemes, S. A., & Peeters, A. (2020). Workplace pedometer interventions for increasing physical activity. *Cochrane Database of Systematic Reviews*(7). doi:10.1002/14651858.CD009209.pub3

Freak-Poli, R. L. A., Cumpston, M., Peeters, A., & Clemes, S. A. (2013). Workplace pedometer interventions for increasing physical activity. *Cochrane Database of Systematic Reviews*(4). doi:10.1002/14651858.CD009209.pub2

Freak - Poli, R. L. A., Cumpston, M., Peeters, A., & Clemes, S. A. (2013). *Workplace pedometer interventions for increasing physical activity (review)*. Retrieved from http://cochranelibrary-wiley.com/doi/10.1002/14651858.CD009209.pub2/abstract;jsessionid=C6E67DF6777DAFB5A133D91F3DD01C1C.f03t03

Funnell, S. C., & Rogers, P. J. (2011). *Purposeful program theory: effective use of theories of change and logic models*. San Francisco, California: Jossey-Bass.

Gill, C., Packer, J., & Ballantyne, R. (2018). Applying Attention Restoration Theory to Understand and Address Clergy's Need to Restore Cognitive Capacity. *Journal of religion and health*, 1-14.

Gilson, N., Brown, W. J., Faulkner, G., McKenna, J., Murphy, M., Pringle, A., . . . Stathi, A. (2009). The International Universities Walking Project: development of a framework for workplace intervention using the Delphi technique. *Journal of Physical Activity and Health, 6*(4), 520-528.

Gilson, N., Faulkner, G., Murphy, M. H., Meyer, M. R. U., Washington, T., Ryde, G. C., . . . Dillon, K. A. (2013). Walk@Work: An automated intervention to increase walking in university employees not achieving 10,000 daily steps. *Preventive Medicine, 56*(5), 283-287. doi:10.1016/j.ypmed.2013.01.022

Gilson, N., McKenna, J., & Cooke, C. (2008). Experiences of Route and Task-Based Walking in a University Community: Qualitative Perspectives in a Randomized Control Trial. *Journal of Physical Activity & Health, 5*, S176-S182. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=s3h&AN=31718659&site=ehost-live

Gilson, N., McKenna, J., Cooke, C., & Brown, W. (2007). Walking towards health in a university community: A feasibility study. *Preventive Medicine, 44*(2), 167-169. doi:10.1016/j.ypmed.2006.09.012

Glaser, B. G., & Strauss, A. L. (1965). Discovery of substantive theory: A basic strategy underlying qualitative research. *The American Behavioral Scientist, 8*(6). Retrieved from https://search-proquest-com.ezproxy.is.ed.ac.uk/docview/1306750665?accountid=10673

Global Advocacy Council for Physical Activity, I. S. f. P. A. a. H. (2010). *The Toronto Charter for Physical Activity: A Global Call to Action,*. Toronto, Canada Retrieved from http://www.globalpa.org.uk/pdf/torontocharter-eng-20may2010.pdf

Glouberman, S., & Zimmerman, B. (2016). Complicated and Complex Systems: What Would Successful Reform of Medicare Look Like? In Pierre-Gerlier Forest, Gregory Marchildon, & T. McIntosh (Eds.), *Changing Health Care in Canada : The Romanow Papers* (Vol. 2, pp. 21-53). Toronto: Toronto: University of Toronto Press.

Gough, D., Oliver, S., & Thomas, J. (2017). *An introduction to systematic reviews* (Second edition ed.). London: SAGE Publications Ltd.

Greenhalgh, T., Humphrey, C., Hughes, J., Macfarlane, F., Butler, C., & Pawson, R. (2009). How do you modernize a health service? A realist evaluation of whole-scale transformation in London. *87*, 391-416. Retrieved from https://doi.org/10.1111/j.1468-0009.2009.00562.x

Greenhalgh, T., Pawson, R., Wong, G., Westhorpe, G., Greenhalgh, J., Manzano, A., & Jagosh, J. (2017). *Quality Standards for Realist Evaluation: For evaluators and peer-reviewers*. Retrieved from London: http://ramesesproject.org/media/RE_Quality_Standards_for_evaluators_and_peer_reviewers.pdf

Greenhalgh, T., Wong, G., Westhorp, G., & Pawson, R. (2011). Protocol - realist and meta-narrative evidence synthesis: Evolving Standards (RAMESES). *BMC Medical Research Methodology, 11*(1), 115. doi:10.1186/1471-2288-11-115

Greenhalgh, T., Wong , G., Westhorpe, G., Pawson, R., Jagosh, J., Manzano, A., & Greenhalgh, J. (2017). What Realists Mean by Context. Retrieved from http://ramesesproject.org/media/RAMESES_II_Context.pdf

Haskell, L. W., Lee, R. I. M., Pate, E. R., Powell, N. K., Blair, A. S., Franklin, A. B., . . . Bauman, D. A. (2007). Physical Activity and Public Health: Updated Recommendation for Adults from the American College of Sports Medicine and the American Heart Association. *Medicine & Science in Sports & Exercise, 39*(8), 1423-1434. doi:10.1249/mss.0b013e3180616b27

Haslam, C., Kazi, A., Duncan, M., Clemes, S., & Twumasi, R. (2019). Walking Works Wonders: a tailored workplace intervention evaluated over 24 months. *Ergonomics, 62*(1), 31-41. Retrieved from https://www.tandfonline.com/doi/pdf/10.1080/00140139.2018.1489982?needAccess=true

Hawe, P., Shiell, A., & Riley, T. (2009). Theorising Interventions as Events in Systems. *American Journal of Community Psychology, 43*(3-4), 267-276. doi:https://doi.org/10.1007/s10464-009-9229-9

Higgins, E. T. (1987). Self-Discrepancy: A Theory Relating Self and Affect. *Psychological Review, 94*(3), 319-340. doi:10.1037/0033-295X.94.3.319

Hildebrandt, V., Koning, M., Proper, K. I., Bosscher, R., van Der Beek, A., & van Mechelen, W. (2001). *The effectiveness of worksite physical activity programs on health related outcomes - a systematic review*. Paper presented at the Medicine and Science in Sports and Exercise.

Hochbaum, G. M. (1958). *Public participation in medical screening programs: A socio-psychological study*: US Department of Health, Education, and Welfare, Public Health Service ….

Hyvönen, K., Törnroos, K., Salonen, K., Korpela, K., Feldt, T., & Kinnunen, U. (2018). Profiles of nature exposure and outdoor activities associated with occupational well-being among employees. *Frontiers in Psychology, 9*.

Jagosh, J. (2017). Introduction to Realist Evaluation and Synthesis: Engage a Lliverpool.

Jagosh, J. (2020). Retroductive theorizing in Pawson and Tilley's applied scientific realism. *Journal of Critical Realism, 19*(2), 121-130. doi:10.1080/14767430.2020.1723301

Jagosh, J., Bush, P. L., Salsberg, J., Macaulay, A. C., Greenhalgh, T., Wong, G., . . . Pluye, P. (2015). A realist evaluation of community-based participatory research: partnership synergy, trust building and related ripple effects. *BMC Public Health, 15*, 725. doi:10.1186/s12889-015-1949-1

Kang, M., Marshall, S. J., Barreira, T. V., & Lee, J.-O. (2009). Effect of Pedometer-Based Physical Activity Interventions. *Research Quarterly for Exercise and Sport, 80*(3), 648-655. doi:10.1080/02701367.2009.10599604

Kaplan, R., & Kaplan, S. (2011). Well-being, reasonableness, and the natural environment. *Applied Psychology: Health and Well-Being, 3*(3), 304-321.

Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology, 15*(3), 169-182. doi:https://doi.org/10.1016/0272-4944(95)90001-2

Karau, S. J., & Williams, K. D. (1993). Social Loafing: A Meta-Analytic Review and Theoretical Integration. *Journal of Personality & Social Psychology, 65*(4), 681-706. doi:10.1037/0022-3514.65.4.681

Katzmarzyk, P. T., Church, T. S., Craig, C. L., & Bouchard, C. (2009). Sitting time and mortality from all causes, cardiovascular disease, and cancer. *Medicine and Science in Sports and Exercise, 41*(5), 998-1005. doi:10.1249/MSS.0b013e3181930355

Kazi, A., Duncan, M., Clemes, S., & Haslam, C. (2014). A survey of sitting time among UK employees. *Occupational medicine, 64*(7), 497-502. doi:10.1093/occmed/kqu099 %

Kelly, P., Murphy, M., & Mutrie, N. (2017). The health benefits of walking. In C. Mulley, K. Gebel, & D. Ding (Eds.), *Walking: Connecting Sustainable Transport with Health* (Vol. 9, pp. 351). Bingley UK: Emerald Publishing Ltd.

Kelly, P., Williamson, C., Niven, A. G., Hunter, R., Mutrie, N., & Richards, J. (2018). Walking on sunshine: scoping review of the evidence for walking and mental health. *British Journal of Sports Medicine, 52*(12), 800. Retrieved from http://bjsm.bmj.com/content/52/12/800.abstract

Kraus, W. E., Powell, K. E., Haskell, W. L., Janz, K. F., Campbell, W. W., Jakicic, J. M., . . . For The Physical Activity Guidelines Advisory, C. (2019). Physical Activity, All-Cause and Cardiovascular Mortality, and Cardiovascular Disease. *Medicine & Science in Sports & Exercise, 51*(6), 1270-1281. Retrieved from https://www.ezproxy.is.ed.ac.uk/login?url=http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=ovftu&AN=00005768-201906000-00022

Lacouture, A., Breton, E., Guichard, A., & Ridde, V. (2015). The concept of mechanism from a realist approach: a scoping review to facilitate its operationalization in public health program evaluation.(Report). *Implementation Science, 10*(153). doi:10.1186/s13012-015-0345-7

Lakey, B., & Cohen, S. (2000). Social support and theory. In S. Cohen, L. G. Underwood, & B. H. Gottlieb (Eds.), *Social support measurement and intervention: A guide for health and social scientists* (Vol. 29, pp. 29-49). New York: Oxford University Press.

Larson, H. K., McFadden, K., McHugh, T.-L. F., Berry, T. R., & Rodgers, W. M. (2017). You can't always get what you want: Expectations, outcomes, and adherence of new exercisers. *Qualitative Research in Sport, Exercise and Health, 9*(3), 389-402.

Lau, E. Y., & Faulkner, G. (2019). Program implementation and effectiveness of a national workplace physical activity intervention: UPnGO with ParticipACTION. *Canadian Journal of Public Health, 110*(2), 187-197. doi:10.17269/s41997-018-0170-2

Le-Masurier, G. C., Sidman, C. L., & Corbin, C. B. (2003). Accumulating 10,000 Steps: Does this Meet Current Physical Activity Guidelines? *Research Quarterly for Exercise and Sport, 74*(4), 389-394. doi:10.1080/02701367.2003.10609109

Lewis-Beck, M. S., Bryman, A., & Futing Liao, T. (Eds.). (2004). *The SAGE Encyclopedia of Social Science Research Methods*. Thousand Oaks, California.

Lock, M., Post, D., Dollman, J., & Parfitt, G. (2020). Efficacy of theory-informed workplace physical activity interventions: a systematic literature review with meta-analyses. *Health Psychology Review*, 1-25. doi:10.1080/17437199.2020.1718528

Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation. A 35-year odyssey. *The American psychologist, 57*(9), 705-717. doi:10.1037//0003-066X.57.9.705

Lottrup, L., Stigsdotter, U. K., Meilby, H., & Corazon, S. S. (2012). Associations between use, activities and characteristics of the outdoor environment at workplaces. *Urban Forestry & Urban Greening, 11*(2), 159-168. Retrieved from https://ac.els-cdn.com/S1618866712000052/1-s2.0-S1618866712000052-main.pdf?_tid=2cfb6918-9fc6-4e85-95b0-e548c45e6b0e&acdnat=1540985288_c1d6cc40a4b72699ee9f0af26eab3eda

Lutes, L. D., & Steinbaugh, E. K. (2010). Theoretical models for pedometer use in physical activity interventions. *Physical Therapy Reviews, 15*(3), 143-153. Retrieved from https://www.tandfonline.com/doi/pdf/10.1179/1743288X10Y.0000000002?needAccess=true

Macniven, R., Engelen, L., Kacen, M. J., & Bauman, A. (2015). Does a corporate worksite physical activity program reach those who are inactive? Findings from an evaluation of the Global Corporate Challenge. *Health Promotion Journal of Australia, 26*(2), 142-145. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=s3h&AN=109156185&site=ehost-live

Malik, S. H., Blake, H., & Suggs, L. S. (2014). A systematic review of workplace health promotion interventions for increasing physical activity. *British journal of health psychology, 19*(1), 149-180. Retrieved from https://onlinelibrary.wiley.com/doi/pdf/10.1111/bjhp.12052

Manzano, A. (2016). The craft of interviewing in realist evaluation. *Evaluation, 22*(3), 342-360. doi:10.1177/1356389016638615

Marchal, B., Kegels, G., & Van Belle, S. (2018). Theory and Realist Methods. In N. Emmel, J. Greenhalgh, A. Manzano, M. Monaghan, & S. Dalkin (Eds.), *Doing Realist Research* (first ed., pp. 79-90). London: SAGE.

Marchal, B., van Belle, S., van Olmen, J., Hoerée, T., & Kegels, G. (2012). Is realist evaluation keeping its promise? A review of published empirical studies in the field of health systems research. *18*, 192-212. Retrieved from https://doi.org/10.1177/1356389012442444

Marquez, D. X., Aguiñaga, S., Vásquez, P. M., Conroy, D. E., Erickson, K. I., Hillman, C., . . . Powell, K. E. (2020). A systematic review of physical activity and quality of life and well-being. *Translational Behavioral Medicine, 10*(5), 1098-1109. doi:10.1093/tbm/ibz198

McEachan, R. R. C., Lawton, R. J., Jackson, C., Conner, M., Meads, D. M., & West, R. M. (2011). Testing a workplace physical activity intervention: a cluster randomized controlled trial. *The International Journal of Behavioral Nutrition and Physical Activity, 8*(1), 29-29. doi:10.1186/1479-5868-8-29

Merton, R. K. (1968). *Social Theory and Social Structure*. New York: The Free Press.

Michie, S. (2014). *ABC of behaviour change theories*. Great Britain: Silverback Publishing.

Mills, C. W. (2000). *The sociological imagination* (40th edition. ed.). Oxford: Oxford University Press.

Morris, J. N., & Crawford, M. D. (1958). Coronary Heart Disease and Physical Activity of Work. *British Medical Journal, 2*(5111), 1485. doi:10.1136/bmj.2.5111.1485

Morris, J. N., & Hardman, A. E. (1997). Walking to health. *Sports Med, 23*(5), 306-332. doi:10.2165/00007256-199723050-00004

Morris, J. N., Heady, J. A., Raffle, P. A. B., Roberts, C. G., & Parks, J. W. (1953). Coronary heart-disease and physical activity of work. *The Lancet, 262*(6795), 1053-1057. doi:10.1016/S0140-6736(53)90665-5

Muir, S. D., Silva, S. S. M., Woldegiorgis, M. A., Rider, H., Meyer, D., & Jayawardana, M. W. (2019). Predictors of Success of Workplace Physical Activity Interventions: A Systematic Review. *Journal of Physical Activity and Health, 16*(8), 647. doi:10.1123/jpah.2018-0077 10.1123/jpah.2018-0077

Mullane, S. L., Toledo, M. J. L., Rydell, S. A., Feltes, L. H., Vuong, B., Crespo, N. C., . . . Buman, M. P. (2017). Social ecological correlates of workplace sedentary behavior. *International Journal of Behavioral Nutrition and Physical Activity, 14*. doi:10.1186/s12966-017-0576-x

Murtagh, E. M., Nichols, L., Mohammed, M. A., Holder, R., Nevill, A. M., & Murphy, M. H. (2015). The effect of walking on risk factors for cardiovascular disease: An updated systematic review and meta-analysis of randomised control trials. *Preventive Medicine, 72*, 34-43. doi:https://doi.org/10.1016/j.ypmed.2014.12.041

Mutrie, N., & Hannah, M. K. (2004). Some work hard while others play hard. *International Journal of Health Promotion and Education, 42*(4), 109-117. doi:10.1080/14635240.2004.10708024

Naczenski, L. M., de Vries, J. D., van Hooff, M. L. M., & Kompier, M. A. J. (2017). Systematic review of the association between physical activity and burnout. *Journal of Occupational Health, 59*(6), 477-494. doi:10.1539/joh.17-0050-RA

Niven, A. (2015). *Paths for All Workplace Step Count Challenge 2014: Changes in physical activity, walking behaviour and motivation for walking, and participant feedback*. Retrieved from

Niven, A., & Hu, D. (2018). Office workers' beliefs about reducing sitting time at work: a belief elicitation study. *Health Psychology and Behavioral Medicine, 6*(1), 15-29. Retrieved from https://www.tandfonline.com/doi/pdf/10.1080/21642850.2018.1428103?needAccess=true

Niven, A., & Markland, D. (2016). Using self-determination theory to understand motivation for walking: Instrument development and model testing using Bayesian structural equation modelling. *Psychology of Sport and Exercise, 23*, 90-100. doi:10.1016/j.psychsport.2015.11.004

Niven, A., Ryde, G. C., Wilkinson, G., Greenwood, C., & Gorely, T. (2021). The Effectiveness of an Annual Nationally Delivered Workplace Step Count Challenge on Changing Step Counts: Findings from Four Years of Delivery. *International Journal of Environmental Research and Public Health, 18*(10). doi:10.3390/ijerph18105140

Norris, S. L., Rehfuess, E. A., Smith, H., Tunçalp, Ö., Grimshaw, J. M., Ford, N. P., & Portela, A. (2019). Complex health interventions in complex systems: improving the process and methods for evidence-informed health decisions. *BMJ Global Health, 4*(Suppl 1), e000963. doi:10.1136/bmjgh-2018-000963

Ogilvie, D., Foster, C. E., Rothnie, H., Cavill, N., Hamilton, V., Fitzsimons, C. F., & Mutrie, N. (2007). Interventions to Promote Walking: Systematic Review. *BMJ (British Medical Journal), 334*(7605), 1204-1207. doi:http://dx.doi.org/10.1136/bmj.39198.722720.BE

Pawson, R. (2003). Nothing as Practical as a Good Theory. *Evaluation, 9*(4), 471-490. doi:10.1177/1356389003094007

Pawson, R. (2006a). Digging for Nuggets: How 'Bad' Research Can Yield 'Good' Evidence. *International Journal of Social Research Methodology, 9*(2), 127-142. doi:10.1080/13645570600595314

Pawson, R. (2006b). *Evidence-based policy: a realist perspective*. London: SAGE Publications Ltd.

Pawson, R. (2013). *The science of evaluation a realist manifesto*. London: SAGE.

Pawson, R., Greenhalgh, T., Harvey, G., & Walshe, K. (2005). Realist review - a new method of systematic review designed for complex policy interventions. *Journal of Health Services Research & Policy, 10*(1_suppl), 21-34. doi:10.1258/1355819054308530

Pawson, R., & Manzano-Santaella, A. (2012). A realist diagnostic workshop. *Evaluation, 18*(2), 176-191. doi:10.1177/1356389012440912

Pawson, R., & Tilley, N. (1997). *Realistic evaluation*. London: Sage.

Pedersen, C., Halvari, H., & Olafsen, A. H. (2018). Worksite Physical Activity Intervention and Somatic Symptoms Burden: The Role of Coworker Support for Basic Psychological Needs and Autonomous Motivation. *Journal of Occupational Health Psychology*. doi:http://dx.doi.org/10.1037/ocp0000131

Perez-Calhoon, M. (2017). *A Mixed-Methods Study: Self-Efficacy and Barriers to Participation in Workplace Wellness Programs.* Brandman University, Retrieved from http://digitalcommons.brandman.edu/edd_dissertations/108

Petticrew, M., Knai, C., Thomas, J., Rehfuess, E. A., Noyes, J., Gerhardus, A., . . . McGill, E. (2019). Implications of a complexity perspective for systematic reviews and guideline development in health decision making. *BMJ Global Health, 4*(Suppl 1), e000899. doi:10.1136/bmjgh-2018-000899

Pfadenhauer, L. M., Gerhardus, A., Mozygemba, K., Lysdahl, K. B., Booth, A., Hofmann, B., . . . Rehfuess, E. (2017). Making sense of complexity in context and implementation: the Context and Implementation of Complex Interventions (CICI) framework. *Implementation Science, 12*(1), 21. doi:10.1186/s13012-017-0552-5

Podlog, L., & Dionigi, R. A. (2009). Psychological need fulfillment among workers in an exercise intervention: A qualitative investigation. *Research Quarterly for Exercise and Sport, 80*(4), 774-787. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed11&NEWS=N&AN=355798800

Pronk, N. P. (2009). Physical activity promotion in business and industry: Evidence, context, and recommendations for a national plan. *Journal of Physical Activity & Health, 6*(2), S220-S235. doi:10.1123/jpah.6.s2.s220

Pronk, N. P., & Kottke, T. E. (2009). Physical activity promotion as a strategic corporate priority to improve worker health and business performance. *Preventive Medicine, 49*(4), 316-321. Retrieved from https://www.sciencedirect.com/science/article/pii/S0091743509003296?via%3Dihub

Proper, K. I., Staal, B. J., Hildebrandt, V. H., van der Beek, A. J., & van Mechelen, W. (2002). Effectiveness of physical activity programs at worksites with respect to work-related outcomes. *Scandinavian Journal of Work, Environment & Health*(2), 75-84. doi:10.5271/sjweh.651

Proper, K. I., & Van Mechelen, W. (2008). *Effectiveness and economic impact of worksite interventions to promote physical activity and healthy diet* Retrieved from Geneva: https://www.who.int/dietphysicalactivity/Proper_K.pdf?ua=1

Public Health England. (2020). Health Matters: Physical activity prevention and management of long term conditions. Retrieved from https://www.gov.uk/government/publications/health-matters-physical-activity/health-matters-physical-activity-prevention-and-management-of-long-term-conditions

Punton, M., Vogel, I., & Lloyd, R. (2016). Reflections from a Realist Evaluation in Progress: Scaling Ladders and Stitching Theory. In: Institute of Development Studies.

Quintiliani, L., Sattelmair, J., & Sorenson, G. (2008). *The workplace as a setting for interventions to improve diet and promote physical activity*. Retrieved from Geneva: https://www.who.int/dietphysicalactivity/Quintiliani-workplace-as-setting.pdf?ua=1

Rogers, P. J. (2008). Using Programme Theory to Evaluate Complicated and Complex Aspects of Interventions. *Evaluation, 14*(1), 29-48. doi:10.1177/1356389007084674

Rogerson, M., Gladwell, V. F., Gallagher, D. J., & Barton, J. L. (2016). Influences of green outdoors versus indoors environmental settings on psychological and social outcomes of controlled exercise. *International Journal of Environmental Research and Public Health, 13*(4), 363.

Retrieved from https://res.mdpi.com/ijerph/ijerph-13-00363/article_deploy/ijerph-13-00363.pdf?filename=&attachment=1

Rosenstock, I. M. (1974). The health belief model and preventive health behavior. *Health education monographs, 2*(4), 354-386.

Rousseau, V., Aubé, C., & Savoie, A. (2006). Teamwork Behaviors: A Review and an Integration of Frameworks. *Small Group Research, 37*(5), 540-570. doi:10.1177/1046496406293125

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *The American psychologist, 55*(1), 68. doi:10.1037/0003-066X.55.1.68

Rycroft-Malone, J., McCormack, B., Hutchinson Alison, M., Decorby, K., Bucknall Tracey, K., Kent, B., . . . Wilson, V. (2012). Realist synthesis: illustrating the method for implementation research. *Implementation Science, 7*(1), 33. doi:10.1186/1748-5908-7-33

Ryde, G., & Brown, H. E. (2017). Physical activity and workplace wellbeing. *The Routledge Companion to Wellbeing at Work*, 298.

Sæther, B. (1998). Retroduction: an alternative research strategy? *Business Strategy and the Environment, 7*(4), 245-249. doi:10.1002/(SICI)1099-0836(199809)7:4<245::AID-BSE157>3.0.CO;2-C

Salas, E., Sims, D. E., & Burke, C. S. (2005). Is there a "Big Five" in Teamwork? *Small Group Research, 36*(5), 555-599. doi:10.1177/1046496405277134

Sallis, J. F., Cerin, E., Conway, T. L., Adams, M. A., Frank, L. D., Pratt, M., . . . Owen, N. (2016). Physical activity in relation to urban environments in 14 cities worldwide: a cross-sectional study. *The Lancet, 387*(10034), 2207-2217. doi:10.1016/S0140-6736(15)01284-2

Sayer, A. (2000). Realism and Social Science. In. doi:10.4135/9781446218730

Scottish Government. (2014). *Let's Get Scotland Walking; The National Walking Strategy*. Edinburgh: Crown Office Retrieved from https://www.gov.scot/publications/lets-scotland-walking-national-walking-strategy/

Scriven, M. (1991). *Evaluation thesaurus* (Fourth edition.. ed.). Newbury Park, Calif.: Sage Publications.

Shearn, K., Allmark, P., Piercy, H., & Hirst, J. (2017). Building Realist Program Theory for Large Complex and Messy Interventions. *International Journal of Qualitative Methods, 16*(1). doi:10.1177/1609406917741796

Smith-McLallen, A., Heller, D., Vernisi, K., Gulick, D., Cruz, S., & Snyder, R. L. (2017). Comparative Effectiveness of Two Walking Interventions on Participation, Step Counts, and Health. *American Journal of Health Promotion, 31*(2), 119-127. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=s3h&AN=121312659&site=ehost-live

http://journals.sagepub.com/doi/pdf/10.1177/0890117116658012

Stragier, J., Abeele, M. V., Mechant, P., & De Marez, L. (2016). Understanding persistence in the use of online fitness communities: comparing novice and experienced users. *Computers in Human Behavior, 64*, 34-42.

Strath, S. J., Kaminsky, L. A., Ainsworth, B. E., Ekelund, U., Freedson, P. S., Gary, R. A., . . . Swartz, A. M. (2013). Guide to the Assessment of Physical Activity: Clinical and Research Applications. *Circulation, 128*(20), 2259-2279. doi:doi:10.1161/01.cir.0000435708.67487.da

Sudholz, B. (2014). *Understanding desk-based employees' and managers' workplace sitting and sitting-breaks*. Retrieved from

Swann, C., Rosenbaum, S., Lawrence, A., Vella, S. A., McEwan, D., & Ekkekakis, P. (2021). Updating goal-setting theory in physical activity promotion: a critical conceptual review. *Health Psychology Review, 15*(1), 34-50. doi:10.1080/17437199.2019.1706616

Teychenne, M., White, R. L., Richards, J., Schuch, F. B., Rosenbaum, S., & Bennie, J. A. (2020). Do we need physical activity guidelines for mental health: What does the evidence tell us? *Mental Health and Physical Activity, 18*, 100315. doi:https://doi.org/10.1016/j.mhpa.2019.100315

The British Psychological Society. (2014). BPS Code of Human Research Ethics (2nd Edition). In. Leicester: The British Psychological Society,.

The RAMESES II Project. (2017a). Philosophies and Evaluation Design. Retrieved from www.ramesesproject.org

The RAMESES II Project. (2017b). What Realists Mean by Context. Retrieved from http://www.ramesesproject.org/media/RAMESES_II_Context.pdf

To, Q. G., Chen, T. T., Magnussen, C. G., & To, K. G. (2013). Workplace physical activity interventions: a systematic review. *Am J Health Promot, 27*(6), e113-123. doi:10.4278/ajhp.120425-LIT-222

Torquati, L., Kolbe-Alexander, T., Pavey, T., Persson, C., & Leveritt, M. (2016). Diet and physical activity behaviour in nurses: a qualitative study. *International Journal of Health Promotion and Education, 54*(6), 268-282. doi:http://dx.doi.org/10.1080/14635240.2016.1169943

Tudor-Locke, C. (2002). Taking steps toward increased physical activity: Using pedometers to measure and motivate. *President's Council on Physical Fitness and Sports Research Digest*.

Tudor-Locke, C., & Bassett, D. R. (2004). How Many Steps/Day Are Enough? *Sports Medicine, 34*(1), 1-8. doi:10.2165/00007256-200434010-00001

Tudor-Locke, C., & Lutes, L. (2009). Why do pedometers work?: a reflection upon the factors related to successfully increasing physical activity. *Sports medicine (Auckland, N.Z.), 39*(12), 981. doi:10.2165/11319600-000000000-00000

UK Department of Health and Social Care. (2019). *UK Chief Medical Officers' physical activity guidelines*. Retrieved from London: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/832868/uk-chief-medical-officers-physical-activity-guidelines.pdf

UK Department of Health Physical Activity Health Improvement and Protection. (2011). *Start Active, Stay Active: A report on physical activity from the four home countries' Chief Medical*

Officers. Retrieved from https://www.gov.uk/government/publications/start-active-stay-active-a-report-on-physical-activity-from-the-four-home-countries-chief-medical-officers

Umstattd, M. R., Baller, S. L., Blunt, G. H., & Darst, M. L. (2011). Correlates of Perceived Worksite Environmental Support for Physical Activity. *Journal of Physical Activity & Health, 8*, S222-S227. doi:10.1123/jpah.8.s2.s222

US Department of Health and Human Services. (1996). *Physical Activity and Health: A Report of the Surgeon General*. (0098-7484). Atlanta, GA. Retrieved from https://www.cdc.gov/nccdphp/sgr/contents.htm

Walton, D. M., Macdermid, J. C., & Nielson, W. (2010). Recovery from acute injury: clinical, methodological and philosophical considerations. *Disability and rehabilitation, 32*(10), 864-874. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed11&NEWS=N&AN=358965656

Weiss, C. H. (1998). *Evaluation: methods for studying programs and policies* (Second ed.). Upper Saddle River, N.J.: Prentice Hall.

Westhorpe, G. (2014). Realist Impact Evaluation: An Introduction. 1-12. Retrieved from https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/9138.pdf

Westhorpe, G. (2019, 15/07/2019). Re: Re: Risk of Bias in RS

Whitehead, M., & Dahlgren, G. (1991). What can be done about inequalities in health? *The Lancet (British edition), 338*(8774), 1059-1063. doi:10.1016/0140-6736(91)91911-D

Williamson, C., Baker, G., Mutrie, N., Niven, A., & Kelly, P. (2020). Get the message? A scoping review of physical activity messaging. *International Journal of Behavioral Nutrition and Physical Activity, 17*(1), 51. doi:10.1186/s12966-020-00954-3

Wilson, D. S. (2014). *Evaluating a Social Cognitive Theory-Based Worksite Physical Activity Intervention.* (PhD). Walden University, Ann Arbor. Retrieved from https://search.proquest.com/docview/1622473460?accountid=10673

Wong , G. (2018). Data gathering in Realist Reviews. In N. Emmel, J. Greenhalgh, A. Manzano, M. Monaghan, & S. Dalkin (Eds.), *Doing Realist Research* (pp. 131-145). London: SAGE Publications Ltd.

Wong, G., Greenhalgh, T., Westhorp, G., Buckingham, J., & Pawson, R. (2013). RAMESES publication standards: realist syntheses. *BMC Medicine, 11*, 21. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3558331/pdf/1741-7015-11-21.pdf

Wong , G., Westhorpe, G., Pawson, R., & Greenhalgh, T. (2013). *Realist Synthesis: Rameses Training Materials*. Retrieved from http://ramesesproject.org/media/Realist_reviews_training_materials.pdf

World Health Organisation. (2008). *Preventing Noncommunicable Diseases in the Workplace through Diet and Physical Activity*. Retrieved from Geneva: https://apps.who.int/iris/bitstream/handle/10665/43825/9789241596329_eng.pdf;jsessionid=7BE163B4205DB7D7F40E69677B781E02?sequence=1

World Health Organisation. (2017). 10 facts on physical activity. Retrieved from http://www.who.int/features/factfiles/physical_activity/en/

World Health Organisation. (2018). *Global action plan on physical activity 2018-2030: more active people for a healthier world.* Geneva: World Health Organisation Retrieved from http://apps.who.int/iris/bitstream/handle/10665/272722/9789241514187-eng.pdf

World Health Organisation. (2020). Home/Health Topics/Physical Activity. Retrieved from https://www.who.int/health-topics/physical-activity#tab=tab_1